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* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. XIV, No. 3.

Part I. Empire Section

BREEDING 575

679. 575:633

Improvement of economic crop plants.

Nature, Lond. 1944 : **153** : p. 499.

An account of Dr Sabnis' presidential address to the 31st Indian Science Congress is given. The application of genetics to plant-breeding is reviewed, also the uses of polyploidy and the utilization of wild types as advocated by Vavilov.

680. 575:633(42)

Thirty-fourth Annual Report of the John Innes Horticultural Institution for the year 1943 (1944) : Pp. 26.

Cytology

It is stated that increased doses of X-rays accelerate the rate of prophase and that breakage frequency is proportional to the dosage. In pollen tubes, a reunion of fragments after X-ray treatment is shown to be almost impossible since the chromosomes are too confined by the small diameter of the pollen tube for any effective movements to take place.

Certain plants of *Campanula persicifolia* were found to possess two telocentric chromosomes obtained from one chromosome by a break at the centromere. Homozygotes with 9 chromosome pairs instead of 8 gave rise to plants in which further breakages were observed, thus indicating that a genetically determined centromere instability was present.

The most effective method of producing polyploids in fruit trees is to soak undried embryos in an 0·05% colchicine solution at 25° C. under normal illumination.

The induction of polyploid bud sports has so far not been accomplished.

Experiments on the growth of pollen tubes in relation to the size of the grain in polyploid fruits have been carried out.

Tests are in progress with the object of defining and measuring the genetical activity of heterochromatin.

Studies on the self-incompatibility of pin and thrum plants of *Primula obconica* are continuing. It is found that thrum plants are always less self-compatible than pin types. Similar work is also in progress with *P. sinensis* and various species of *Lythrum*.

Cherries

The following varieties are in the final selection stage, having been grown for the last ten years in regional trials. No. 193, Merton Bigarreau, is a large firm-fleshed cherry with a good flavour and small stone. It is derived from a cross between Knight's Early Black and Bigarreau Napoleon. No. 404, Merton Heart, is a rich flavoured heart-shaped cherry from the cross Bigarreau de Schrecken x Elton. Both seedlings have almost black fruits.

Apples

The new seedling, Merton Russet, is described as a rich-flavoured, late-keeping apple, obtained from the cross Sturmer Pippin x Cox's Orange Pippin.

Blackberries

The new variety Merton Thornless has been introduced and 2500 plants have already been distributed. Tests with Merton Early indicate that it could be raised from seed with a high degree of uniformity.

Radishes

The problems of incompatibility in the radish have been investigated. Partial self-incompatibility and cross-incompatibility are both found, the former being very general and the latter quite common. Pollen tube growth in both diploids and tetraploids was investigated.

Tomatoes

Selection for high fertility is being continued with intervarietal tetraploid lines of tomatoes. Investigations on hybrid vigour show that four F_1 heterotic families have given a significantly higher yield than any of the standards grown in the trials.

681. 575:633(54.8)

Reports of subordinate officers of the Department of Agriculture, Madras for 1940–1941 : Pp. 178.

Report on the operations of the Department of Agriculture, Madras Presidency for the year 1940–41 (1942) : Pp. 74.

Millets

Strain A.S.3313 has proved superior to A.S.1093 and will be grown in districts where the latter strain is now grown. Crosses have been made to produce varieties with juicier stalks for fodder purposes and the inheritance of *Striga* resistance is being studied. A selection with a high Vitamin B_1 content is being used in further breeding work to combine this desirable character with high yield.

Paddy

Thirteen new strains were released during the year, eight being selections from local strains and five being hybrids. The parentage of the strains is as follows: Co.14, a tall, erect and stiff-strawed variety, from Co.3 x a Burma type; Co.15, a fine, blast resistant form, from BGE24 x Korangusamba; Co.16, a coarse, blast resistant type, also from BGE 24 x Korangusamba; Co.17, an early selection from Vadansamba*; Co.18, a selection from Vellaikar; Co.19, a selection from Tellasannavadlu†; Co.20, a high-yielding disease resistant type, selected from Sirumani‡; Mtu.15, an early non-lodging and non-shedding variety from Nallarlu x Garikasannavari; Mtu.16, a form suitable for low-lying areas, from Konamani x a floating paddy; Ptb.13, a selection from Kayama; Ptb.14, from Mascathi; and Ptb.15 and Ptb.16, both from Kavunginpoothala.
Pure line cultures of several varieties have been made and are undergoing trials and hybridization work is continuing. A dwarf mutant from X-rayed GEB.24 has been found fit for multiplication and release, giving a higher yield of straw than its parent.

Potatoes

A cross between Great Scot and Coonoor White 45 gave the heaviest yield in the main crop season while Ben Cruachan gave the heaviest yield in the second and third crop seasons.

Cotton

Two new strains of Cambodia cotton Co.3 and Co.4 were released during the year. They were derived from the cross Co.2 x U.4 and exhibit superior fibre production and slightly increased yields. Trials were made with other types of cotton and breeding work is being continued to produce cottons for local conditions.

Sugar cane

The following selections showed resistance to mosaic: Co.205, Co.422, Co.434, Co.511 and S.H.38.

Ground-nut

A.H.32 was shown to be the best bunch variety of ground-nut and A.H.25 the best spreading variety. Two new strains A.H.685 and A.H.698 have shown a better return in preliminary trials.

Coconut

Hybrid trees are showing considerable vigour and are early bearing.

Cowpeas

Two strains of cowpeas, C.521 and C.422, were superior to other strains tested.

Gram

Trials with red gram varieties have shown many to be superior to the local strains. Breeding has commenced with a wilt resistant variety.

682. Rodrigo, E. 575:633(54.8)

Administration Report of the Acting Director of Agriculture, Ceylon for 1942 (1943) : Pp. D.16.

Paddy

The two 3-month Dahanala selections, 37YM–2014 and 37YM–2291, are being tested and continue to do well. Sinnanayan and Rathkarayal selections are being further tested, as also are

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* Chinnavadan Samba according to the Report of the Director of Agriculture, Madras.
† Sirumani, *ibid.* ‡ Thellasannavadlu, *ibid.*

selections of Madael and Honderawala. The selection Vellai-Illankalayan 28061 has been shown to be remarkably adaptable to all sorts of conditions. A trial is in progress for establishing a pure line selection for late Maha sowing. The hybrid of Kurulutuduwi (b–13) x Hmawbi 39 is being selected to isolate 5, 5½ and 6 month classes; the Baiang x Vellai-Illankalayan (28061) hybrid is also being grown for selecting strains with the required age.

In saline resistance trials with 18 foreign and two local varieties, the 3–4 month varieties mostly succumbed, with the exception of Kagga, Bile Kagga, Pokkali and six Indo-Chinese varieties. The 5-month varieties S.R.26B, Uvar-Karuppan and Karuthakuran also survived under saline conditions. Some of the saline resistant paddies have successfully resisted heavy flooding. The hybrid b13 x Hmawbi 39 and the variety Gonahena Samba, which have resisted lodging, are being maintained and selected.

Luffa

A ribbed selection of luffa, LA.33, is said to have good quality and high yield.

Cassava

The five best cassava strains under investigation have been MU.11, MU.28, MU.122, MU.84 and MU.77. The desired objective of combining good yield and flavour with an elimination of the tendency to develop prussic acid after the seventh month of growth has been achieved in the hydrid MU.11 x MU.10.

Tea

High jat teas appear to be less susceptible than low jat teas to the virus disease phloem necrosis.

Gourds

MC.42, a new selection of bitter gourd, is high yielding and resistant to fruit fly. The new line of snake gourd, TA.77, was selected for quality and yield; although susceptible to fruit fly it is less so than other varieties tested.

Egg plant

A new line, Sm.81, is said to be high yielding, resistant to bacterial wilt and possess fruit of excellent quality.

Cowpea

Two lines of cowpea, V.248 and V.443, have been released. The first is said to be resistant to *Agromyza* and aphids, very high yielding, ready for picking in 2½ months and with luxuriant vegetative growth making it suitable for use as a cover or green manure crop. V.443 is a selection for quality and earliness, maturing in 2 months; it produces very long attractive pods of the asparagus bean (Murunga-Me) type and is particularly suitable for rotation with paddy.

683. 575:633(59.2)

Report on the operations of the Department of Agriculture, Burma, for the years 1941–42 and 1942–43 (1943) : Pp. 26.

Paddy

An improved hybrid paddy, being multiplied for distribution in 1942, is intended to replace the variety Taungeikpan. A high yielding Midon class paddy with good milling quality, suitable for the Mohnyin tract, was also increased for distribution in 1942.

Plants resistant to *Helminthosporium Oryzae*, and the Myit-po disease were selected. Most strains, when grown in India in 1943, showed glume colours and times of maturity different from those found under Burmese conditions.

Sesamum

An improved hybrid strain with 30% higher yield and 59–60% higher oil content is being multiplied.

Butter beans

Hybrids with low prussic acid and high yield are being developed.

Pigeon peas

Several types suitable for cotton inter-cropping are being multiplied.

684. 575:633(71)

Sixty-eighth Annual Report of the Ontario Agricultural College and Experimental Farm 1942 (1943) : Pp. 71.

Wheat

Crosses have been made between winter wheats and mildew resistant spring wheats in order to obtain resistant winter forms.

Oats
An attempt is being made to combine high yield and resistance to stem rust, leaf rust and smut.

Barley
Attention is being paid to straw strength, yielding ability, disease resistance and malting quality. Selections of mildew resistant strains have been made. The new variety Galore has been selected for distribution in 1943. It arose from the cross Nobarb x O.A.C. No. 21.

Forage Crops
Red clover, timothy and orchard grass have been selected for high yielding, leafiness, winter-hardiness and disease resistance. Strain tests with lucerne are being conducted.

685. DEWAN, P. M. 575:633(71)
Report of the Minister of Agriculture, Province of Ontario, for the year ending March 31st, 1943 : Pp. 106.

Horticultural Experiment Station, Vineland
Breeding is in progress on the following fruit and vegetable crops: apples, cherries, peaches, pears, plums, grapes, raspberries, strawberries, tomatoes, asparagus, cabbages, cucumbers, lettuce, musk-melons, onions, rhubarb, sweet corn and pepper. A list is given of varieties introduced by the Station up to 1942.

Western Ontario Experiment Farm
Variety trials are reported on corn, beans, soya beans and oats.

GENETICS 575.1

686. WIGAN, L. G. and
MATHER, K. 575.113.4:575.4
Correlated response to the selection of polygenic characters.
Ann. Eugen. 1942 : **11** : 354–64.

It is pointed out that since any one chromosome usually contains a number of genes affecting a number of different characters, selection for one character "will generally be accompanied by a correlated response in another character, even when the latter is not itself subject to the direct action of a selective force". Evidence of this correlative response in certain selections of *Drosophila melanogaster* is presented.
It is further pointed out that the correlated change will frequently have a negative selection value and serve as a delaying factor in evolutionary change, thus tending to prevent undue responses to transient environmental changes. If the correlated response however occurs in a disused organ, this organ will almost invariably suffer degeneration.

687. MATHER, K. and
EDWARDS, P. M. J. 575.113.5:576.12
Specific differences in Petunia. III. Flower colour and genetic isolation.
J. Genet. 1943 : **45** : 243–60.

The authors discuss the evolution of interspecific differences with reference to flower colour in *Petunia*. It is suggested that constant differences of specific rank arise, not by the simple mutation of major genes, but by the operation of natural selection on polygenes which regulate the expression of the major genes. The maintenance of a specific character depends therefore on polygenic balance which is believed to deteriorate if natural selection becomes inoperative. This will occur when one of the major genes no longer determines phenotypic expression.
Polygenic balance may be either internal, as in the case of inbreeding homozygous types, or relational, as in the case of outbreeding, heterozygous forms. In both cases, the maintenance of balance depends on natural selection, and if the operation of selection becomes modified by the development of partial genetic isolation—either by geographical isolation or by a tendency towards inbreeding—the nature of the polygenic balance will have an important effect in the development of interspecific genetical isolation.

688. LUCAS, C. E. 576·12
Excretion, ecology and evolution.
Nature, Lond. 1944 : **153** : 378–79.
The course of evolution may have been largely determined by the development of responses by organisms to their own metabolites or those of other species.

689. GREGOR, J. W. 576.16:581.5
The ecotype.
Biol. Rev. 1944 : **19** : 20–30.
A detailed analysis of ecotypic differentiation is presented, together with a discussion on the precise significance to be attributed to the terms coenospecies, ecospecies, subspecies and ecotype. These groups are treated in relation to Huxley's concept of the ecocline.

CYTOLOGY 576.3

690. CASPERSSON, T. 576.312:581.192
"Chromosomin" and nucleic acids.
Nature, Lond. 1944 : **153** : 499–500.
The author agrees with the views expressed by Callan (cf. "Plant Breeding Abstracts", Vol. XIV, Abst. 372) on the distribution of nucleic acid in the nucleus. Ultra-violet absorption measurements are held neither to support nor to oppose the postulated existence of chromosomin. It is pointed out further that the composition of the nucleus in the resting condition differs profoundly from that at metaphase; in the latter stage, absorption spectra have been obtained indicating the presence of nucleic acid in the chromosomes, also of proteins containing tyrosine and tryptophane.

691. GULLAND, J. M.
BARKER, G. R. and
JORDAN, D. O. 576.312:581.192
Terminology of nucleic acids.
Nature, Lond. 1944 : **153** : p. 194.
The authors deprecate the introduction of the terms "chromonucleic acid" and "plasmonucleic acid" proposed by Pollister and Mirsky (cf. "Plant Breeding Abstracts", Vol. XIV, Abst. 16). They point out that these terms imply a cytological distribution of nucleic acids not strictly in accord with the facts, and that a separate biological classification of these substances is not desirable.

692. STEDMAN, E. and
STEDMAN, E. 576.312:581.192
"Chromosomin" and nucleic acids.
Nature, Lond. 1944 : **153** : 500–02.
In reply to a note by Caspersson (cf. Abst. 690), the authors state that the chromosomin content of nuclei has been determined by direct analysis of herring sperm. The presence of chromosomin in metaphase chromosomes may be indicated by the fact that this protein is relatively more abundant in frequently dividing tumour tissue than in tissues with permanently resting nuclei. The uncertainty surrounding the interpretation of ultra-violet absorption spectra is stressed.

693. PONTECORVO, G. 576.312.341
Structure of heterochromatin.
Nature, Lond. 1944 : **153** : 365–67.
The present state of knowledge concerning heterochromatin is reviewed. Chromosome segments may appear heterochromatic in some tissues but indistinguishable from euchromatin in others; also different heterochromatic segments in the same cell may exhibit different degrees of staining. These cases are examples of allocycly which is regarded as the characteristic property of heterochromatin. Other characteristics include occasional non-homologous pairing and genetical inertness.
On the basis of these facts, the following hypothesis is put forward. Euchromatic segments are regarded as a linear sequence of heterogeneous chromomere types. Statistical considerations indicate that a uniform staining reaction would be expected from the aggregate action of the chromomere units which are believed to be distributed at random. Heterochromatin, on the other hand, is believed to contain a high proportion of similar or identical chromomere types.

Since random assortment no longer obtains, the staining reactions of the heterochromatic segments will differ both *inter se* and from the euchromatin. Such differences would constitute the basis of the observed allocycly.
Heterochromatin might arise by the formation of minute re-duplications from the euchromatin. These segments would then constitute small regions of homogeneous constitution and would be allocyclic with reference to the parent euchromatin.
It is believed that the polygene theory and the observation that the same character may be determined by different genetic systems in closely allied forms, harmonize with this hypothesis.

694. PANTULU, J. V. 576.312.35:582
Further chromosome numbers in the *Caesalpiniaceae.*
Curr. Sci. 1943 : **12** : p. 274.
Chromosome numbers were counted during meiosis in pollen mother-cells of the following species of the Caesalpiniaceae: *Amherstia nobilis* Wall., *Saraca indica* L. and *Brownea* sp. In each case $n = 12$.

695. AMIN, K. C. 576.356.5:581.04:575.127:633.51
Application of colchicine to cotton.
Indian Fmg 1943 : **4** : 257–58.
A general description is given of the action of colchicine on plant cells for the production of polyploids, particular emphasis being laid upon the production of fertile polyploids from diploid sterile hybrids.

696. LEWIS, D. 576.356.5:581.162.5:634
The incompatibility sieve for producing polyploids.
J. Genet. 1943 : **45** : 261–64.
Triploids may be obtained from diploid fruit trees by heat-shock treatment of the pollen mother cells followed by selfing. In the case of normally self-incompatible types, haploid pollen grain development will be inhibited by the stylar tissue while suitable dyad grains may effect fertilization. Some success has been obtained by applying this technique to the pear varieties Fertility and Conference.

BOTANY 58

697. LEWIS, D. and
LA COUR, L. F. 581.162.32:578.08
Collection of pollen and artificial wind pollination.
Nature, Lond. 1944 : **153** : 167–68.
A method of collecting pollen by suction is described. The apparatus may be used also in the quantitative estimation of pollen productivity and, when the technique of manipulation is reversed, it can be employed as a pollinator.

698. BATEMAN, A. J. 581.162.5
Specific differences in *Petunia*. II. Pollen growth.
J. Genet. 1943 : **45** : 236–42.
The author confirms the conclusions drawn by Mather (cf. Abst. 700) on the nature of incompatibility systems.

699. MATHER, K. 581.162.5
Genetical control of incompatibility in angiosperms and fungi.
Nature, Lond. 1944 : **153** : 392–94.
The author reviews the mechanisms which effect out-breeding. Spatial separation of the gametes, temporal separation of the gametes, e.g. protandry and protogyny, and incompatibility systems are the most important.
In the fungi, incompatibility systems are of the haploid-haploid type, the prevention of homozygous fertilizations occurring at the gametic level. Two types of heterothallic differentiation are recognized, firstly a simple type involving a single pair of allelomorphs, and secondly, a more complex arrangement in which one or more multiple allelomorphic series are present. In the latter case, mating is inhibited by the co-incidence of any particular allele in both of the prospective gametes.
Three types of incompatibility system are found in the angiosperms. In *Gastera* and cacao, a pseudo-incompatibility system has been reported in which homozygous zygotes abort after fertilization. The haploid-diploid system is much more frequent; in this, the inhibiting effect

occurs between the haploid genotype of the pollen grain and the diploid tissue of the style. Multiple allelomorphs are again involved, the combination of the same allele in the style and the pollen grain being non-functional.

A diploid-diploid system is found in many other angiosperms and includes the heterostylic category as a special case. Only two allelomorphs per locus are involved here although several loci may be operative. The genotype of the pollen grain is not a discriminative factor in these forms, incompatibility being determined by the heterozygosity of the male and female diploid somata.

The relative efficiencies of these systems are discussed with reference to their capabilities in maintaining population heterozygosis.

700. MATHER, K. 581.162.5:576.12:575.113.5
Specific differences in *Petunia*. I. Incompatibility.
J. Genet. 1943 : **45** : 215–35.

Incompatibility is classified as heteromorphic or homomorphic, the first category involving morphological variation and the second not. In the latter case, gametic and zygotic incompatibilities may be distinguished, depending on whether the determination of compatibility is controlled by the male gamete or the original diploid male soma. Pseudo-compatibility is found where the action of incompatibility alleles is masked by non-allelic modifying genes.

The evolution of gametic incompatibility is discussed with reference to the genus *Petunia*. It is believed that the process is gradual and comes about by the differentiation and segregation of a minimum of three *S* genes and the subsequent development of inter-compatibility reactions by the effect of modifying factors on the primary allelomorphic series. Evidence for the action of non-allelic modifying factors is presented. The whole process is thought to be regulated by natural selection which may favour out-breeding in various circumstances.

A reverse change from incompatibility to compatibility can take place more simply by the formation of non-allelic inhibiting factors.

PLANT DISEASES AND PESTS 632

701. VINCENT, J. M. 632.3:576.16
Variation in the nitrogen-fixing property of *Rhizobium trifolii*.
Nature, Lond. 1944 : **153** : 496–97.

Evidence is presented to support the view that strains of *R. Trifolii* may exhibit varying degrees of nitrogen-fixing ability even though identical in serological reaction.

702. WILSON, G. F. 632.6:576.16
The stem and bulb eelworm, *Anguillulina dipsaci* (Kühn, 1858) : the importance of collating evidence on the behaviour of biologic strains.
Ann. Appl. Biol. 1943 : **30** : 364–70.

The degree of adaptability of eelworm races to hosts other than normal has been investigated and the significance of the results discussed with reference to the concept of physiological races.

703. RIPPER, W. E. 632.7:576.16
Biological control as a supplement of chemical control of insect pests.
Nature, Lond. 1944 : **153** : 448–52.

The author advocates the development of selective insecticides in order to counteract the development of insecticide-resistant pest strains which have already arisen in the following species: the San José scale (*Aspidiatus perniciosus*), the red scale (*Aonidiella aurantii*), the black scale (*Saissetia oleae*), the citricola scale (*Coccus pseudomagroliarum*), the codlin moth, the primary screw worm (*Cochliomyia americana*) and the citrus thrips.

ECONOMIC PLANTS 633

704. KAWERAU, E. 633:577.16(41.5)
Ascorbic acid. Part 3 : The ascorbic acid content of fruits and vegetables grown in Eire.
Sci. Proc. R. Dublin Soc. 1944 : **23** : 181–96.

The results of analyses of Irish grown fruits and vegetables for vitamin C content are presented. Special attention has been paid to potatoes, rose hips and blackcurrants.

705. GALLAGHER, P. H. and
WALSH, T. 633.1–2.19–1.521.6(41.5)
The susceptibility of cereal varieties to manganese deficiency.
J. Agric. Sci. 1943 : **33** : 197–203.

Barley and rye were markedly insensitive to manganese deficiency while wheat and oats may be seriously affected. The latter crops show marked differences in varietal susceptibility. The wheat variety Atle was severely affected while April Red and Red Fife were only slightly to moderately affected and recovered well. The most resistant oat varieties were Potato, Victory II and Glasnevin Success 10.

WHEAT 633.11

706. UMAR, S. M. 633.11:575.061.6:575.182
A case of maternally-inherited variegation in wheat.
Indian J. Genet. Pl. Breed. 1943 : **3** : 61–66.

The inheritance of a variegation in wheat resulting in longitudinal stripes of yellow and green on the leaves, stems and ears was studied by selfing variegated plants and by crossing them reciprocally with normal green plants. It was found that the character was transmitted only through the mother.

707. JOHNSON, T. and
HAGBORG, W. A. F. 633.11:575.061.6:581.02
Melanism in wheat induced by high temperature and humidity.
Canad. J. Res. 1944 : **22** : Sect. C. : 7–10.

The wheat varieties Apex and Renown may develop melanic discoloration if grown under conditions of high temperature and humidity. Marquis is not affected.

708. SHARMAN, B. C. 633.11:575.11:581.02:575.127.2
Branched heads in wheat and wheat hybrids.
Nature, Lond. 1944 : **153** : 497–98.

The expression of the gene pair *Bh bh* in the cross *Triticum turgidum* (*bh bh*) x *T. vulgare* (*Bh Bh*) has been found to depend on environmental conditions. The normally recessive gene *bh* determines branched heads but the development of this feature may be inhibited by long day-length or high temperature. It is even possible to reduce the production of branched heads in the homozygous recessive by late-spring sowing.

709. ARMSTRONG, J. M. and 633.11:575.127.5:633.289:576.356:581.04
MCLENNAN, H. A. 633.11:575.129:633.289
Amphidiploidy in *Triticum-Agropyron* hybrids.
Sci. Agric. 1944 : **24** : 285–98.

Amphidiploids have been produced by colchicine treatment of the F_1 seed of *Triticum-Agropyron* hybrids. *A. glaucum* was used in all the crosses and the following wheat species: *T. vulgare*, *T. dicoccum*, *T. turgidum*, *T. durum*, *T. pyramidale* and *T. persicum*. The morphology of the hybrid families is described. In the amphidiploid family from *T. turgidum* x *A. glaucum*, the chromosome number did not remain constant at 70. Aneuploid offspring were produced and it was discovered that meiosis exhibited various irregularities, univalents, trivalents and quadrivalents being found. Meiotic irregularities and sterility decreased in the F_3; pairing was more complete although there was an increased tendency to form multiple associations, sexavalents and septavalents occurring occasionally. Segregates with the higher chromosome numbers were the most fertile.

710. PLATT, A. W. and
LARSON, R. 633.11:581.4:575.11:575.127.2
An attempt to transfer solid stem from *Triticum durum* to *T. vulgare* by hybridization.
Sci. Agric. 1944 : **24** : 214–20.

Crosses were made between Golden Ball, a solid-stemmed variety of *T. durum* ($n = 14$), and R.L.1097 and Regent, hollow-stemmed varieties of *T. vulgare* ($n = 21$), in an attempt to transfer the solid-stemmed character to the *vulgare* type. No success was obtained and the authors suggest that their failure lends support to the hypothesis that there exists a gene O_D for hollowness in the C genome that is epistatic to all other genes for solidity in the A and B genomes. The only possibility of effecting the desired combination would be by segmental interchange between semi-homologous chromosomes.

711. Tyner, L. E. and
Broadfoot, W. C. 633.11–2.4–1.521.6(71)
Field tests of the differential reaction of wheat varieties to root rot.
Sci. Agric. 1943 : **24** : 153–63.
It is shown that certain varieties of wheat possess a much greater degree of resistance than others to *Ophiobolus graminis, Fusarium* spp. and *Helminthosporium sativum*, when tested under field conditions. The most resistant varieties are Red Fife, Kota, O.A.C.35, White Russian, Blue Ribbon, Huron, Kitchener, Double Cross, Caesium, Kubanka, Red Russian, Swedish, Major, McMurachy's Selection and White Head.
The disease symptoms resemble those of drought to some extent, and, in general, facilitate fungal attack. The resistance of a variety is most easily determined within the 4–7 days prior to maturity.

712. 633.11:664.641.016:575(94.2)
A new wheat for South Australia.
J. Dep. Agric. S. Aust. 1944 : **47** : p. 302.
Ridley is a new variety derived from the cross Nabawa x Hard Federation. It combines high yield with good baking quality but is susceptible to stem rust.

BARLEY 633.16

713. 633.16:575(41.5)
Twelfth annual report of the Minister for Agriculture, Department of Agriculture, Éire 1942–43.
Dublin 1943 : Pp. 77.
Barley breeding is being undertaken with particular reference to Spratt-Archer types. Spratt-Archer 37 No. 3 has already been distributed to growers and selection No. 4 is being propagated for distribution. A number of other selections and hybrids, together with new varieties, are under trial. In large scale field trials, Spratt-Archer 37 No. 3 has maintained its position as a high yielder with a low grain nitrogen content.

714. 633.16:575(42)
Camton barley.
Nat. Inst. Agric. Bot. Cambridge, January, 1943 : Pp. 4.
A new product of the Cambridge Plant Breeding Institute is described.
Camton barley was bred to produce a variety suitable for growth on the richest soils without lodging. Under such conditions the nitrogen content of the grain is relatively high so that the variety is most useful as a feed barley. Selected from the cross Spratt x (Archer x Goldthorpe), it tends to be intermediate in growing habit. It has shorter and stouter straw than Spratt and is highly resistant to lodging. The ear is held stiffly upright and is of great density. The grain is similar in colour and general appearance to Spratt, though shorter and broader.

715. McCalla, A. G. 633.16:575(71)
Titan: a new feed barley.
Pr. Bull., Alberta 1943 : **29** : 1–2.
Titan is a selection from a cross between Trebi, a high-yielding, rough-awned variety, and Glabron, a smooth-awned but lower yielding variety. It is a smooth-awned fodder barley, characterized by strong straw, upright habit and a high degree of resistance to loose smut. It compares favourably in yield with established varieties and although having a lower protein content than Newell is as good as other varieties in this respect.

MILLETS AND SORGHUM 633.17

716. Pruthi, H. S. and
Singh, M. 633.171–2.7–1.521.6(54)
Stored grain pests and their control. III. Natural resistance of different grains to insect attack.
Misc. Bull. Imp. Coun. Agric. Res. New Delhi 1943 : No. 57 : p. 13.
In chapter 3 entitled "Natural resistance of different grains to insect attack," the authors found the following grains not to be attacked by store pests when kept for two years under conditions

where the insects had free access to the grain: *Avena sativa*, *Panicum miliaceum* (china), *P. frumentaceum* (shama), *Setaria italica* (kauni), *Paspalum scrobiculatum* (kodon), *Panicum miliare* (gandli), *Eleusine coracana* (marua), *Pennisetum typhoideum* (bajra), *Phaseolus Mungo* (aghania and mungia) and *Pisum arvense* (kirao).

717. Miles, L. G. 633.174:575.42(94.3)
Field crops. Breeding grain sorghums for Queensland.
Qd Agric. J. 1943 : **57** : 261–65.

Two new sorghum varieties introduced into Queensland have shown great promise. The first, Ajax, possesses all the good qualities of Kalo and is a non-lodging type. The other variety, Betty, although subject to lodging on some soils, is capable of giving good yields of large milo type grain.

Dwarf strains of Kalo have been selected, some of which yield well and mature early. Strains with open heads have been selected also from the variety Wheatland; they may be of use in combating grub attack in the humid coastal districts.

Hybridizations between tall and dwarf varieties are being effected with a view to combining the heavy yield and open head of the former with the dwarf growth of the latter.

RICE 633.18

718. Kadam, B. S. and
Ramiah, K. 633.18:575.113:001.4
Symbolization of genes in rice.
Indian J. Genet. Pl. Breed. 1943 : **3** : 7–27.

In Appendix I of this paper a list is given of the gene symbols used by various authors to denote characters in rice; the need of a proper system of nomenclature is indicated. Appendix II gives an alphabetical list of the basic symbols proposed by the Rice Sub-Committee of the Imperial Council of Agricultural Research and the characters represented by them. The principle on which symbols have been based is mainly on the lines recommended by De Haan with an attempt to link up with work on other crops. Conventions in use in *Drosophila*, *Zea Mays* and *Gossypium* have been observed so that many characters in other crops have the same value in rice. Appendix II gives much information on the inheritance of various characters in rice with suggestions as to the genes involved.

719. Chakrabarti, S. 633.18:575.12(54.1)
What's doing in All-India. Andrew Sail: prolific winter paddy.
Indian Fmg 1943 : **4** : p. 318.

A new variety of winter paddy, Andrew Sail, has recently been distributed by the Department of Agriculture, Assam. It was selected from a cross between two local varieties, Latamaguri and Lakshmijoha. It is high yielding and superior in many other characters.

FORAGE GRASSES 633.2

720. Crombie, B. 633.2/3:578.08:575
The breeding of grasses and clovers.
J. Dep. Agric., Éire 1943 : **40** : 286–90.

The author gives an account of the methods used in producing new strains of grasses and clovers.

721. Gorman, L. W. and
Lambert, J. P. 633.2/3.00.14(93.1)
The Grasslands Division substation at Lincoln.
N.Z. J. Sci. Tech. 1943 : **25** : Sect. A : 73–80.

This report records the establishment of a sub-station of the Grassland Division at Lincoln. Varietal tests with grasses and clovers are reported.

722. Dore, W. G. and
Roland, A. E. 633.2:582(71.6)
The grasses of Nova Scotia.
Proc. N.S. Inst. Sci. 1941–1942 : **20** : 177–288.

The authors give a detailed taxonomic account of the grasses of Nova Scotia, including in most cases a map of the distribution.

723. MOFFETT, A. A. 633.287:576.312.35
Note on the cytology of Rhodes grass.
Rhod. Agric. J. 1944 : **41** : 11–13.
Five strains of Rhodes grass, *Chloris Gayana*, were examined cytologically from root tip preparations. Four of the strains possessed 40 somatic chromosomes, whilst one, a Kenya variety, showed 20 chromosomes.

ROOTS AND TUBERS 633.4

724. WALLACE, J. O. 633.426(93.1)
N.Z. resistant swede.
N.Z. J. Agric. 1943 : **67** : 341, 343.
Selected seed of the Danish variety Wilhelmsburger Otofte has been grown in New Zealand under the name of N.Z. Resistant Swede. It is particularly resistant to club-root disease and possesses good grazing qualities.

725. MOREAU, R. E. 633.491:581.02(67.61)
The climatic background to the problem of potato varieties for East Africa. Part I.
E. Afr. Agric. J. 1944 : **9** : 127–35.
The climatic requirements of *Solanum tuberosum* and *S. andigenum* are discussed with reference to the problem of their adaptability to East African conditions.

726. MOREAU, R. E. 633.491:581.143.26.035.1(67.8)
The yield and maturity period of potatoes (*Solanum tuberosum*) at low latitudes.
Emp. J. Exp. Agric. 1944 : **12** : 13–30.
The author reviews the suggestions advanced to explain the low yields of potatoes in the tropics. It is concluded that there is insufficient evidence to prove that the yield reduction is attributable to short day length.

727. BLACK, W. and 633.491–2.411.4–1.521.6
COCKERHAM, G. 633.491–2.8–1.521.6
Some modern aspects of potato production.
Trans. Highl. Agric. Soc. Scot. 1943 : Pp. 17.
The authors outline the present state of our knowledge with regard to virus and blight diseases. The degree of susceptibility of many potato varieties to the above-mentioned diseases is discussed. General production details are also given.

728. 633.491–2.484–1.521.6
Dry rot of potatoes.
Adv. Leafl. Minist. Agric. Fish., Lancs. 1944 : No. 218 : Pp. 4.
A description is given of dry rot with causes and methods of control. It is mainly a disease of early varieties. May Queen, Ninetyfold, Arran Pilot and Catriona are very susceptible; Sharpe's Express, Di Vernon, Edzell Blue and Duke of York may suffer severely while Epicure is fairly resistant. Doon Star is the most susceptible main crop variety, but trouble is sometimes experienced in clamps of Majestic and Redskin.

729. COCKERHAM, G. 633.491–2.8–1.521.6
The reactions of potato varieties to viruses *X*, *A*, *B* and *C*.
Ann. Appl. Biol. 1943 : **30** : 338–344.
The reactions of 146 potato varieties to graft infection with virus diseases X, A, B and C are reported. Responses are classified under the three categories of immunity, field immunity and field susceptibility.

FIBRES 633.5

730. CHAKRABARTI, S. 633.51:575(54.1)
What's doing in All-India. Better cotton for Assam.
Indian Fmg 1943 : **4** : p. 317.
From trials with about 100 varieties of long staple cotton from abroad, at least one variety has been selected which should be valuable under Assam conditions. Valuable characters were found among other varieties and it is proposed to undertake hybridization to combine all the desirable characters. Trials will also be made to find the most suitable districts for long-staple cotton production.

731. HUTCHINSON, J. B. 633.51:581.6
The effect of environment on hair characters and spinning value in Sea Island cotton.
J. Text. Inst., Manchr. 1943 : **34** : T61–T69.
The paper includes an account of varietal differences in Sea Island cotton in respect of hair immaturity counts.

732. 633.51:581.6(54)
Annual report of the Director, Technological Laboratory, Indian Central Cotton Committee for the year ending 31st May, 1943.
Bombay 1943 : Pp. 36.
The results are given of spinning and other tests made on Indian cottons during the year ending 31st May, 1943.

733. PANSE, V. G. and SAHASRABUDHE, V. B. 633.51:581.6:578.08
A rapid method of sampling for fibre-weight determination in cotton.
Indian J. Genet. Pl. Breed. 1943 : **3** : 28–44.
A rapid method of fibre weight determination suitable for plant breeders is described. Ten to twelve determinations can be made per hour and a standard error of 4% of the mean is claimed for the examination of a small number of bunches per plot.

734. HUTCHINSON, J. B. 633.51–1.524:581.9(72.98)
Notes on the native cottons of Trinidad.
Trop. Agriculture, Trin. 1943 : **20** : 235–38.
The distribution of the two native cottons *Gossypium hirsutum* L. var. *marie-galante* (Chev.) Hutchinson, and *G. barbadense* L. is recorded for the different regions of Trinidad. The problem of whether these two types are native to the island is discussed.

735. GHOSE, R. L. M. 633.523:581.47:575.116.061.1
The genetics of (*Corchorus*) jute. The inheritance of pod shape and its linkage relationship.
Bull. Indian Cent. Jute Cttee 1943 : **6** : 366–69.
In a hybrid between round and oval podded types, the F_1 were round podded though distinguishable from the round podded parent. In the F_2, segregation gave a 3 : 1 ratio of round to oval podded. A close linkage is reported between the factors for pod shape and anthocyanin pigmentation, with a crossing-over value of 8%.

736. 633.525.2
Uses of the common stinging nettle (*Urtica dioica*).
Mon. Sci. News 1944 : No. 30 : p. 2.
Investigations made by the Royal Botanic Gardens at Kew in collaboration with other institutions and commercial firms have shown that the stems of the common stinging nettle contain from 5-10% of strong bast fibres composed of pure cellulose. It is thought that nettles might be used on a commercial scale in the future if an adequate supply could be ensured by cultivation.

SUGAR PLANTS 633.6

737. HOLME, R. V. 633.61.00.14(72.92)
Annual report of the Research Department of the Sugar Manufacturers' Association Ltd.—1942–43.
J.A.S.T. Quart. 1943 : **7** : No. 2 : 1–30.
The results of varietal tests of sugar cane varieties are reported, differences in yield, spacing reaction and response to fertilizers being noted.

738. LAUBSCHER, F. X. 633.62:575.42(68)
A new sweet sorghum variety.
Fmg S. Afr. 1943 : **18** : 841–42, 856.
A new variety, known as Haakdoorn, obtained in the Potgietersrust district, has a much higher yield of plant material than the popular Red Ambercane. The new variety also contains 60% more sugar in the sap than the latter. It is well suited for growing under western Transvaal conditions.

739. 633.71:575(68.9)

Trelawney Tobacco Research Station. Annual Report for 1943.

Tob. Res. Bd, S. Rhodesia 1943 : Publ. No. 7 : Pp. 39.

A trial of seven varieties revealed marked differences in seasonal response. Virginia Bright and White Stem Orinoco did not seem able to take advantage of improved growing conditions after a period of drought, while Bonanza was able to make further rapid growth.

Development of the F_2 from a cross between two vigorous varieties, Willow Leaf and Jamaica Wrapper, was poor, whereas when the weak-growing Gold Dollar was crossed with Jamaica Wrapper a vigorous F_2 was obtained. Other promising crosses in the F_2 generation were Bonanza x Willow Leaf and Bonanza x Jamaica Wrapper. *Nicotiana glutinosa* and the variety Ambalema have been utilized in breeding for mosaic resistance. The F_1 of hybrids between eelworm resistant and susceptible types showed an intermediate degree of resistance.

740. 633.72–2.8–1.521.6(54.8)

Annual Report for the year of the Tea Research Institute of Ceylon 1942.

Bull. No. 24 : Pp. 55.

Phloem necrosis of tea has been transmitted by grafting and is considered to be due to virus infection. Bushes referred to as having "low jat appearance" seemed the most susceptible while high jat material has so far proved resistant. Insufficient material has been tested to prove that resistance is always associated with high jat characters in this way.

741. Thomas, A. S. 633.73:575.22:631.524:581.02(67.61)

The wild coffees of Uganda.

Emp. J. Exp. Agric. 1944 : **12** : 1–12.

An account is presented of the geographical distribution, genetical variation and response to environmental factors of the four coffee varieties native to Uganda, viz. *C. eugenioides* S. Moore, *C. canephora* Pierre, *C. excelsa* A. Chev. and *C. spathicalyx* K. Schum.

742. 633.79.00.14(42)

Salmon, E. S. 633.79:575.247

Twenty-sixth report on the trial of new varieties of hops, 1942.

J. Inst. Brew. 1944 : **50** : 28–36.

Yield trials of 118 Anglo-American hop varieties are reported. The best variety was found to be H56 with 30¼ cwts. per acre; Q43 (Bullion Hop), R3/100, EE69, B16, K55, OZ79, 219 and 347 also gave good yields with over 25 cwts. per acre. All these, with the exception of EE69 and 347, were grown with only one bine to the string.

A bud sport of the Nonsuch Hop known as OM26 was found to be richer in α resin than its parent and it is suggested that similar bud sports should be looked for in the Golding and Fuggle varieties.

OIL PLANTS 633.85

743. Webster, C. C. 633.854.56:581.162.32:575.127.2

Observations and experiments on flowering and pollination of the tung tree.

E. Afr. Agric. J. 1944 : **9** : 136–43.

The flowering habit of *Aleurites montana* is described, also the conditions under which natural pollination is effective. Artificial pollination is fairly easy and successful crosses of *A. montana* x *A. Fordii* were obtained.

744. Blackman, G. E. 633.854.78.0014(42)

Sunflowers as an oil seed crop.

J. Minist. Agric. 1944 : **50** : 517–21.

In 1941, nineteen varieties of sunflower from the main sunflower producing countries were grown and eight varieties selected for further study. Later trials have reduced the number of suitable varieties and three are now being grown in England, viz. Pole Star, Southern Cross and Mars.

745. Deshpande, R. B. 633.854.797:575.061.633

A case of chlorophyll deficiency in safflower (*Carthamus tinctorius* L.).

Curr. Sci. 1943 : **12** : 273–74.

A case of chlorophyll deficiency in safflower (*Carthamus tinctorius* L.) is described, the deficiency being recessive and inherited on a monofactorial basis.

746. MARTIN, G. 633.913
Competitive rubber plants.
J. R. Soc. Arts 1944 : **92** : 146–55.
Surveying the known sources of natural rubber the author finds none that are in the same class as *Hevea* rubber. In the absence of this type, however, the most promising species, in descending order of importance, are considered to be : *Landolphia Thollonii, Taraxacum kok-saghyz, Cryptostegia grandiflora* and *Parthenium argentatum.*

FRUITS 634

747. INGRAM, C. 634.2:581.142:575.11
Apparent manifestation of a paternal habit.
Gdnrs' Chron. 1944 : **115** : p. 178.
Early germination, characteristic of *Prunus campanulata*, is transmitted to the hybrids *P. dawyckensis* x *P. campanulata* and *P. subhirtella* x *P. campanulata.*

NUTS 634.5

748. KUMAR, L. S. S. and
JOSHI, W. V. 634.58:575.11.061.6
Inheritance of flower colour in *Arachis hypogea L.* (groundnut).
Indian J. Genet. Pl. Breed. 1943 : **3** : 59–60.
In a cross between an orange-flowered variety of ground-nut and a white-flowered mutant which arose from it, the orange flower colour was partially dominant over the white and was inherited according to a monogenic ratio of 1 : 2 : 1 of orange, pale orange and white flowered types. The symbols O_r and o_r are proposed for the orange and white flowered characters respectively.

OTHER FRUITS 634.7

749. HUNTER, A. W. S. 634.723–2.452–1.521.6:575.12:632.421.1
Rust resistant black currants.
Canad. Hort. and Home Mag. 1943.
Rust resistant black currants have been obtained from crossing commercial varieties with a wild resistant type from Manchuria. Some of the seedlings obtained also exhibit resistance to powdery mildew.

750. EATON, E. L.,
EIDT, C. C.,
PICKETT, A. D. and
HOCKEY, J. F. 634.73(71)
The blueberry.
Fmrs' Bull. Canada. Dep. Agric. 1943 : No. 120 : Pp. 30.
This bulletin includes an account of the blueberry varieties commonly grown in Canada.

751. NEWTON, W. 634.74:577.16
Combining beauty with utility in rose breeding.
Sci. Agric. 1944 : **24** : 304–06.
High ascorbic acid contents (1266, 2383 and 2780 mg. per 100 grm. of flesh, respectively) are reported for *Rosa nutkana, R. Moyesii* and their hybrid descendant *R. Eddiei.*

752. GUSTAFSSON, Å. and
SCHRÖDERHEIM, J. 634.74:577.16:581.162.5
Ascorbic acid and hip fertility in *Rosa* species.
Nature, Lond. 1944 : **153** : 196–97.
The ascorbic acid contents of a number of *Rosa* types are presented. Reciprocal crosses between *R. canina* and *R. rubigenosa* produced hybrids differing in degree of fertility and in ascorbic acid content. These two values were found to be inversely related, a finding which further investigations have extended to other cases.
Since fertility bears a significant relationship to ascorbic acid content, it is suggested that generalizations on the relation between polyploidy and vitamin C content should be re-examined in the light of these discoveries.

753. HARRISON, J. W. H. and
JACKSON, G. A. D. 634.74:577.16:581.162.5
Ascorbic acid and hip fertility in *Rosa* species.
Nature, Lond. 1944 : **153** : 403–04.
The authors have determined the ascorbic acid contents of *R. mollis* var. *typica*, *R. dumetorum* var. *rameali*s and the cross between them. The hybrid is heterotic in respect of vegetative vigour, highly sterile and has an ascorbic acid content intermediate between those of its parents. The absence of a negative correlation between vitamin C content and hip fertility is contrasted to the theory advanced by Gustafsson and Schröderheim (cf. Abst. 752)

754. MELVILLE, R. 634.74:577.16:581.162.5
Ascorbic acid and hip fertility in *Rosa* species.
Nature, Lond. 1944 : **153** : 404–05.
The author is unable to confirm the relationship between ascorbic acid and hip fertility established by Gustafsson and Schröderheim (cf. Abst. 752). It is pointed out that mixed data relating to more than one species might well produce a false negative correlation between these two qualities.
No significant correlation could be established in *R. canina* between the ascorbic acid content of the hips and the number of pips nor do seasonal variations in the number of pips appear to be inversely related to changes in vitamin C content.

FORESTRY 634.9

755. MELVILLE, R. 634.972.8:582:581.9:575.12(42)
The British elm flora.
Nature, Lond. 1944 : **153** : 198–99.
The taxonomy and distribution of British elm species and varieties are briefly described. *U. stricta* Lindley includes three varieties, var. *stricta* Lindley, var. *Goodyeri* Melville and var. *sarniensis* (Loud.) Moss, which form a topocline in which the leaf breadth increases from west to east.
Interspecific hybridization is frequent and of economic importance since timber quality is considerably affected. It should be possible to breed improved strains with high quality timber and resistance to Dutch elm disease.

756. PESCOTT, E. E. 634.973:581.142:576.16
Germination of the seed of Mallee Eucalypts.
Vict. Nat. 1941 : **58** : p. 8.
[From For. Absts. 1943 : **5** : p. 29.]
Evidence against the view that the seeds of these eucalypts are not germinable is provided by the fact that seedlings could be raised from various species.

VEGETABLES 635

757. CRANE, M. B. and
MATHER, K. 635.15:581.162.32
The natural cross-pollination of crop plants with particular reference to the radish.
Ann. Appl. Biol. 1943 : **30** : 301–08.
The degree of intervarietal crossings has been investigated between the two self-incompatible varieties Icicle and Scarlet Globe. Inter-crossing decreases rapidly and regularly with distance and is negligible beyound 300 feet, if large populations are concerned. Under these circumstances bees confine their visits to small areas.

758. 635.34:581.6
Cabbage for dehydration.
J. Minist. Agric. 1944 : **50** : 656–67.
The quality of cabbage varieties is discussed with reference to their suitability for dehydration.

759. MUKERJI, B. 635.48:581.6(54)
Indian rhubarb as substitute for "official" rhubarb.
Curr. Sci. 1943 : **12** : p. 275.
The Indian rhubarb, *Rheum Emodi*, is compared in medicinal properties with *Rheum officinale* and

Rheum palmatum. Some varieties of the Indian rhubarb can possibly be used to replace the other two species in medical practice, though there are some varieties that do not conform to British Pharmacopoeia specifications.

760. Pal, B. P. and
Singh, H. B. 635.646:581.145.1
Floral characters and fruit formation in the eggplant.
Indian J. Genet. Pl. Breed. 1943 : **3** : 45–58.

Various aspects of fruit formation in the egg plant were studied including the following: the size of buds on the day previous to opening; the stages of flower opening and anther dehiscence; pollen viability; stigma receptivity; length of style; efficiency of hand pollination and the effect of bagging the flowers; the period between pollination and fruit formation; self-sterility and cross incompatibility; dropping of unopened buds; parthenocarpy; and period of maturation of the fruit.

761. 635.652–2.3–1.521.6
635.652–2.483–1.521.6
Reid, W. D. 635.652–2.8–1.521.6
Resistance of beans against bacterial-wilt anthracnose, and bean-mosaic.
N.Z. J. Agric. 1943 : **67** : 411–12.

A summary is given of a trial of bean varieties for resistance to bacterial wilt, anthracnose and bean mosaic. All runner bean varieties have proved resistant to the three diseases. Burnley selections of Canadian Wonder and Dun have been highly resistant to bacterial wilt and mosaic, but the former has been susceptible to anthracnose. Black Prince, Blue Pod, Woods Centenary, Dun and Zulu King were moderately resistant to the three diseases. Methods of control are discussed.

Part II. Foreign.

STATISTICS 519

762. Brieger, F. G. 519.24
Coeficiente de variação e índice de variança. (**Variation coefficient and index of variance**).
Bragantia, São Paulo 1942 : **2** : 313–31.
The calculation and use of the two values in agricultural experiments are described for the benefit of Portuguese readers.

763. Cochran, W. G. 519.24
The χ^2 correction for continuity.
J. Iowa St. Coll. Sci. 1942 : **16** : 421–36.
There are various ways in which the orthodox application of the χ^2 test is not strictly accurate or strictly valid; this paper deals with two of them (i) when the data consist of discrete values and (ii) in the testing of cell frequencies where one expected frequency is small.
(i) If the data can take only discrete values, so also does the χ^2 estimated from the data; and it is not strictly accurate to test a discrete value of χ^2 against the tabular continuous χ^2 distribution. The correction discussed is as follows: If the estimate of χ^2 is a, and b is the next possible lowest value of χ^2, the appropriate probability is given by the table taking χ^2 equal to $\frac{1}{2}(a + b)$. This rule is reconciled with the rule by Yates of diminishing the absolute value of the difference between the observed and expected frequencies by one half; also artificial numerical examples are cited to show that the correction given is a good approximation to the exact probability.
(ii) Suppose there are r cells, n observations, that k_i is the observed frequency and np_i the expected frequency in the ith cell. Let p_r be small compared with all the p_i. Assuming that k_r is distributed as a binomial, or in the limit as a Poisson, the paper gives the 1% and the 5% points of χ^2_m which is defined as follows:—

$$\chi^2_m = \chi^2_{r-2} + \frac{(k_r - np_r)^2}{np_r q_r}$$

where χ^2_{r-2} based on $r \times 2$ degrees of freedom is the χ^2 arising from the first $r - 1$ cells only. When $p_r \to 0$, $q_r \to 1$, and writing $m = np_r$ we get

$$\chi^2_m = \chi^2_{r-2} + \frac{(k - m)^2}{m}.$$

Comparison with three artificial numerical cases would tend to show that for the 5% level we may have an expected frequency as low as 0·5, and at the 1% level a frequency as low as 2. The case of two cells with low expected frequencies is only mentioned. S. N. C.

PHYSICS 53

764. Gurwitch, A. and Gurwitch, L. 535.61–31:576.353 577.15
(**Twenty years of mitogenetic radiation**).
Uspehi Sovremmennoĭ Biologii (Advances in Modern Biology) 1943 : **16** : 305–34.
The authors review the early progress of their work on mitogenetic rays and report upon some of the recent developments. The increased rate of mitosis in onion roots in the zone close to another growing point provided the first indication of the existence of the radiation from dividing cells. The suspicion that the radiation was in the ultra-violet band was supported by the discovery that the effect was transmitted through quartz but not through films of gelatine. Later a similar effect was produced by ultra-violet radiation of low intensity and of short duration.
It was then found that the division of yeast cells in a liquid medium was stopped completely by adding an infinitesimal amount of cancerous blood which contains an inhibitor. They started dividing again when irradiation was applied from without. More recently still it has been found that ultra-violet irradiation of peptone or certain mixtures of amino-acids resulted in their condensation into peptides. The radiation effective is confined to the long wave end of the spectrum; an energy of not less than 105 kg. cal./mol. is required and this can be supplied either in 1 photon, (2700Å) or in 2 photons, the first with a limit of 87·4 kg. cal./mol. (= 3260Å) and the second in the visible or infra-red zone with a limit of 18 kg. cal./mol., i.e. about 15,000Å. The condensation can be induced also by adding liver extract in the light without irradiation. It has

been shown that monochromatic light is converted by the liver extract into ultra-violet of a wave length corresponding roughly to about double the photon energy of the light used. The effectiveness of the radiation depended entirely on the degree of absorption by the peptone or amino-acids and was independent of the size of the photon. These conditions corresponded in all details to those required for mitogenetic activity, which is therefore thought to depend exclusively on the stimulation of the process of peptide synthesis. Many substances that have the property of inducing cancer have been shown to possess mitogenetic activity, whilst other closely allied substances that are without that property are also without mitogenetic activity. The inhibitor present in the blood from cancerous individuals was found to be localized in the superficial film surrounding the cells in the tumour.

The mitogenetic activity of the blood has been found to be reduced by fatigue and certain psychic depressions, and increases during certain maniacal disturbances. The activity of the former could be raised by the addition of small quantities of H_2O_2 or of maniacal blood; this latter had a higher deamination capacity and the effect lasted for several hours, as if some body capable of reproducing itself, such as an enzyme, were responsible. The same effect was produced by subjecting the depressed blood to irradiation from a mitogenetic source.

A solution of amino-acids after irradiation also proved to have the capacity of acting as a source of radiation for almost 24 hours after its irradiation. Again it would appear that a self-propagating body of an enzyme-like nature had been produced. Further, several true enzymes, when added in infinitesimal quantities to any amino-acid, cause the production in unlimited quantities, though in very dilute concentration, of active groups which in their mitogenetic activity are indistinguishable from true enzymes, and are referred to as fermentoids. It is suggested that the amino-acid is broken up by the added enzyme into radicals and that these are then synthesized into a fermentoid of similar or identical properties to those of the enzyme added, which serves as a protein matrix for the synthesis of active groups, which then by autocatalysis propagate themselves independently of the protein molecules.

BREEDING 575

765. 575:633(43)
631.531.12(43)

Vorbildliche Leistungen deutscher Saatgutzüchter. (**Exemplary achievements of German seed breeders**).
Forschungsdienst **1943** : **15** : p. 101.

A note is given on a meeting to confer awards for the work of seven German seed growing firms. Dr Roemer referred to the "pioneer work" of German breeders in producing from the former medley of varieties, types suited to German soil and climate and high yielding as well as of good quality. The prize-winning varieties were: the spring barley Hauter 2, Janetzkis Astra maize, the potato Ragis Primula, the Altdeutsche Luzerne [Old German lucerne], Steinacher Wiesenschwingel [Steinach meadow fescue] and three new stringless beans: Schreibers lange Brech [Schreiber's Long Snap], Schreibers frühe Wachs [Schreiber's Early Wax] and Schreibers Wachs Saxa Gold.

766. *Avdonin, N. 575:633(47)

[**Some results of scientific work during a year of war (1941)**].
Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture) Moscow **1942** : No. 6–7 : 45–52.

The work of eleven research institutes is reviewed. The Siberian Cereal Institute has produced new varieties of spring and winter wheat, an early variety of pea and two early potato varieties. The South Eastern Cereal Institute has produced several varieties of hard and soft spring wheat and of winter-hardy winter wheat, three varieties of sunflower and one variety of *Pennisetum typhoideum*. The Non-Blackearth Zone Cereal Institute has produced eight varieties of *Triticum-Agropyron* hybrids. The State Agronomic and Forest Amelioration Institute has discovered five species of sweet-briar with a high carotene content in their leaves; found good varieties of willow for the production of tanning extracts; and worked out methods of cultivation and exploitation of *Euonymus verrucosa*. The State Cotton Institute has produced varieties of wilt resisting cotton plants and also forms with green, russet, light and dark brown fibre which need no dyeing when made up into textile materials. The Flax Institute has produced a *Fusarium* resistant

* An extended summary of this paper is on file at the Bureau.

strain of flax, and one that is proof against lodging. The Institute of Rubber-bearing Plants has concentrated on the agronomical and breeding technique of kok-saghyz; studied the phytopathology of the plant; elaborated effective methods of pest control; designed and constructed a number of sowing, cultivating, root and seed harvesting machines and implements which have proved efficacious in field conditions; and carried out considerable work in introducing kok-saghyz and guayule in new areas.

767. Zembrovskiĭ, I. M., Krutikov, N. E. and Ažigoev, P. K. 575:633(47)
(A programme of investigation into agricultural problems to be undertaken at the Kazah Agricultural Institute).
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V. R. Viljjamsa (Bull. V. R. Williams Kazah. Inst. Agric.) 1940 : No. 5–6 : Pp. 39.

In the programme of work which the Institute hopes to carry out, the following are matters of interest to plant breeders: the breeding and selection of herbage plants, including *Agropyron*; spring wheat (soft and hard); millet, to make it withstand cold; rice, to eliminate lodging, shedding of the grain, and poor yields; potatoes; *Cucurbitaceae*; Jerusalem artichoke for stock-feeding; vegetables; and fruit varieties, to replace those which have degenerated as a result of continuous propagation by cuttings phasically old. Variety trials of vines are also to be undertaken. The aim of all the breeding and selection is to improve the existing crops in Kazahstan and adapt new varieties to the various conditions found there. I. Z

768. 575:633(48.5)
Årets försöksledarmöte. **(Annual meeting of directors of research).**
Lantmannen 1943 : **27** : 1007–11.

Försöksledarmötet. **(The research directors' meeting).**
Ibid. 1943 : **27** : 1028–30.

At this meeting R. Torsell of Ultuna read a paper on the increases in yield due to legume breeding. Evidence of the progress made is based on the work of the Swedish Seed Association and, as regards the latest varieties, on the permanent trials of the Agricultural Research Institute.
Many of the old land varieties formerly grown have disappeared, which makes it difficult to estimate yield increases attained in the last 50 years.
At Svalöf and in other localities a yield increase of fully 20% may be reckoned for garden peas mainly owing to the performance of Torsdags II, which however was surpassed slightly at the Västgöta Branch Station by Munk and Ambrosia II.
Some improvements appear to have been attained with early culinary varieties judging from the trials run by the Agricultural Research Institute.
In southern and central Sweden there has been an equal improvement in fodder peas, but in general they have somewhat surpassed the culinary varieties in yield, e.g. Hero gave 10% more seed than Torsdags and 8–10% more than Solo. In experiments in Götaland Parvus compared well with Hero.
The performance of the early fodder pea No. 01080 (from Torsdags II x Solo) for southern and central Sweden also represents a further advance.
In Central and Upper Norrland the only fodder pea available, in addition to the several land varieties in Jämtland and Ångermanland, is Bottnia, which shows a 5–12% increase in yield. At the Västernorrland Branch Station an increase of at least 10% has been obtained from the new varieties 05321 and 05322, derived from a cross between the early grey pea and the yellow pea; No. 05321 also represents an improvement in earliness.
Vetch breeding too has given some promising results which have however not yet reached the practical farmer. The older improved varieties of vetches show no higher yields that the unimproved small vetches.
The need for a more fixed central direction of variety trials and a large number of trials was pointed out by Ivar Bachér, speaking on the future of regional research. Instruction courses for research directors and assistants are also needed in order that local experiments may be conducted with care and skill.
Ingvar Granhall discussed the cultivation of flax and hemp and the results of flax variety trials and some fibre quality investigations carried out at the flax laboratory at Svalöf before its destruction by fire in July, 1942.

The pliable Blenda variety was judged the best in quality in variety trials, where lodging did not occur.
Hemp cultivation experiments are to be extended with official support. Other aspects of research on this crop should also be developed without delay.
The new flax laboratory now in process of construction will offer much greater facilities for improving the quality of flax and hemp. It should be possible in future to handle in the Svalöf laboratory the whole harvest from fibre plant experiments.

769. Åkerman, Å. 575:633(48.5)
Årsberättelse över Sveriges Utsädesförenings verksamhet under år 1942. (**Annual report of the work of the Swedish Seed Union during the year 1942**).
Sverig. Utsädesfören. Tidskr. **1943** : **53** : 117–69.

Forty-three new varieties, élites and strains that have been put on the market among others during 1942 are listed. They include wheat, rye, barley, oats, peas, lucerne, timothy, fodder beet, sugar beet and potatoes. The results of the main station at Svalöf and of the branch stations are taken separately.

Svalöf.
The winter 1941–42 was extremely severe and taken with the unusually hard winter of the two preceding years the results with wheat showed that the variety 01331 b (Skandia I x the extremely winter-hardy line Sv 28/1056 from a Dutch land wheat) can be graded as 8·8 in the scale for winter-hardiness (10 = quite undamaged, 1 = total loss). Other hardy strains were Vg 01312 and Vg 01340 (cross between Ankar and 01200 b and 01000 respectively). Satisfactory progress was shown by 01350 (Äring I x Stål) and 01351 and 01352 from the same cross. It would seem possible also to isolate remarkably hardy lines from the cross Äring x Skandia I and unexpectedly hardy lines have been segregated from crosses between spring and winter wheats.
Äring II and III were susceptible to the bacterial disease "black chaff" but when crossed with resistant lines such as Sv 28/1056, susceptible and resistant lines segregate.
Rye breeding followed the same lines as in previous years.
Crosses continue to be made to produce a variety of white oats for southern Sweden, superior in yield, stiffness and grain quality to the existing varieties. Among the black oat varieties, the extremely early variety 01331 from the cross Guldregn x Orion II is very promising. It competes in grain yield with Guldregn II and Seger.
Crosses of Maja and Kenia barley with Swedish land barley have produced a large number of lines from which to select good types of forage barley.
The new pea 03023 (from Holgersson) yielded more than Torsdags II and good results were obtained from the yellow pea 03101 (from Torsdags II x 0351) and the green pea 04001 (from Kjellgrens green pea). The highest yielding forage peas were 01080 (Solo x 0172) and Parvus.
Sv 36/10 (from Gråvicker) was the highest yielding vetch.
Selection from red clover crosses continued as in the previous year, also selection in lucerne and timothy. Studies on the effect of X-rays on white clover and *Poa* continue. Work on potatoes was continued on the same lines as in previous years.
The results of the year's cultivation of root crops is described.
Among the new varieties of flax some lines from Sv 015 (a sister variety to Blenda) gave promising results. In linseed, 01000 yielded as well as it did last year.
In hemp, a new hermaphrodite strain of Polish origin and a selection from the Rumanian land variety Moldau, gave a high yield and was satisfactorily early.
New lines of sweet lupin are being investigated.
Among a number of foreign varieties of tobacco grown, some seem to thrive in the Swedish climate. It is hoped that by crosses with these, new varieties may be produced of better quality than the varieties now grown. Crosses of local varieties for snuff tobacco have reached the F_2.
Treatment of soya beans with X-rays has already produced a number of differing types which are probably induced mutations, some of them with stiffer stems and earlier than the original variety. These are being investigated.
In poppy breeding the aim is to produce a type that is early, high yielding and with capsules that remain closed when ripe. A higher resistance to drought is also required.
Selections are being made on sunflowers for earliness and high yield.
Maize also is being crossed and selected for earliness and high yield.

The department for chromosome research has produced three varieties of winter rape, one of spring rape, two of turnip rape and one variety of white mustard. Comparative tests were made on tetraploid and diploid clover, beets and flax. The fact that the diploid showed a higher chlorophyll content, calculated on the green weight, is probably due to the greater thickness of the leaves of the polyploid forms and not to any special disposition of the tetraploid to produce less chlorophyll. The cytogenetics of yeast are being studied. The institute of genetical research has made comparative tests with rye-wheat and wheat and with tetraploid and diploid varieties of barley.

The work carried out during 1941–42 by the branch stations is summarized as follows:—

Ultuna.

In tests of new strains of winter wheat certain lines from the crosses Ergo x Gluten and Ankar x Svea II showed a higher yield of grain and a better quality than the standard varieties Ergo and Gluten. Among leguminous crops a new fodder pea, 01080, gave a 10% higher yield of grain than Hero and Solo. A strain, 02261, from a Polish vetch gave a very high yield.

Östgötland.

Comparative tests are recorded for most crops. Damage caused by cicadas was prevalent in winter wheat. Thule III, Gluten and Weibulls Ergo showed a good resistance, also the new varieties Borg and Sv 01331 (Skandia x 28/1056).

Västgötland and Värmland.

Comparative tests were made on most crops.

Västernorrland.

In oats, of the station's own strains, Å 34/73 is specially mentioned for good yield and the yield of lines from crosses with Vidar, recorded in previous years, was again promising. The new early Å strains of fodder pea, from crossings with Skedoms pea did well and two are being multiplied.

Jämtland and Över-Norrland.

Comparative tests were made on most crops. R. M. I.

770. 575:633(48.5)
633.00.14(48.5)

Pehrson, J.

Försöksfältet vid lantbrukshögskolans institution för växtodlingslära, 1942–1943. (**Experiment plots at the Agricultural College Institute for the study of Plant Cultivation 1942–1943**).

Lantmannen **1943** : **27** : 942–44; 960–62.

Comparative trials and multiplication of the best types were the two main lines of E. Åberg's work on Tibetan barley and spring wheat, begun in 1935. Tests for some years of thirteen types of barley (mainly naked 6-rowed forms) with Stella and Maja as controls show that though the Tibetan forms are inferior in yield several types have many desirable features of potential value for future breeding; flour and quality tests also gave promising results.

The range of oil plants cultivated included not only oil rape and turnip rape, white mustard, Fiskeby mustard (for the first time in the locality), linseed, poppy and sunflower, but also the more uncommon soya, safflower, *Camelina* and *Madia.*

Different varieties of poppies have been cultivated for some years at the Institute, without being included in variety trials. Peragis, Mahndorf and the earlier Turkish poppy have proved suitable for cultivation in the district and gave good results; yields were, however, greatly reduced by drought.

Twenty different types of sunflower were grown at the Institute and out of these the short, relatively high yielding, Russian variety Karlik [Dwarf] proved of value for growing in the locality. In view of the difficulties of harvesting and drying any useful information on the subject will be welcomed at the Institute.

The commonest soya bean varieties undergoing trials are Manitoba, Brown, Aro, Wilnensis and Altonagaard. Some American varieties sent over by E. Åberg from America also seem promising. Though the soya bean is a short-day plant, it is thought that it will be possible to grow it even in the northerly parts of Sweden, if breeding operations are successful. The possibility of developing safflower as an oil crop for Sweden is also being explored, the selection of a type with full seeds and without prickles on the leaves being one of the aims in breeding.

Variety tests of flax, hemp and peas were conducted, and also a few trials of the much discussed "dinga" (cf. "Plant Breeding Abstracts", Vol. XIII, Abst. 689).
Experiment plots for 264 varieties of potatoes have been laid out for study; the survey of potato varieties in Sweden by N. O. Jeppson has been concluded and the results will be published.
G. Sköldin has been carrying out an extensive study of wild and cultivated rubber bearing plants; kok-saghyz appears to be the only one likely to be of value for cultivating. It appears superior to numerous Swedish species of dandelions in yield of rubber.

771. HASTINGS, W. R. 575:633(73)
1944 All-Americas show trade activity in wartime.
Seed World 1943 : **54** : No. 8 : 8–9; 14, 16.

Pepper (*Capsicum*)
A new pimiento pepper called Georgia Improved Perfection is described. It is stated to possess the thickest and mildest flesh of all peppers and to be particularly suitable for canning.
A smooth, cylindrical fruited type known as Manatee Wonder has been produced. It is similar to Early Calwonder and Oakview Wonder.
A paprika pepper called Kentucky Gem has recently been produced. It is said to possess good growth and vigour, and to yield well except in the coldest climates.

Lettuce
The new variety Great Lakes is of the Iceberg type and is described as a summer lettuce very resistant to tip-burn.

Cucumber
A new variety known as Cubit with white firm flesh and very good yield is described.

Beans
A new dwarf snap bean, known as Keystonian Greenpod, is described. It is said to possess high quality fibreless pods and to continue bearing for a longer period of time than other varieties.

Sweet corn
A hybrid sweet corn of the Golden Evergreen type, known as Aristogreen, has recently been introduced. It is described as very tall with a high ear and fodder yield, and useful for late garden use and cream style canning.

772. CORBETT, R. B. 575:633(75.2)
Research—a war effort.
55th Rep. Md Agric. Exp. Sta. 1941–1942 : Pp. 360.

Peaches
A new peach variety 1–15 is to be released. It is a yellow freestone of Hale type, maturing five days before Elberta; it is described as firm, and of excellent size and quality.
Three new varieties, Sunhigh, New Day and Pacemaker, show certain promise but need further testing.

Lima beans
Nine strains of the new Baby Lima, two of the Henderson Bush and one of green-seeded Henderson were tested in variety trials. It was found that the variety Early Baby Potato and two other numbered Baby varieties were of better quality than and yielded as well as the Henderson variety.

773. HAWKINS, R. S. (Editor) 575:633(79.1)
Fifty-second Annual Report of the Arizona Agricultural Experiment Station for the year ending June 30, 1941. (1942) : Pp. 99.

Wheat
Breeding for smut resistance, making use of the smut immune variety Hard Federation-Martin, has resulted in the production of 169 highly resistant progenies. These are now being submitted to yield trials.
The rust resistant variety Hope has been crossed with Baart and Sonora in a project for developing lines resistant to rust.

Sorghum
Variety tests were made with sorghums under conditions of early, mid-season and late planting. The best yield was obtained from the new variety Manko, whilst the root-rot resistant type

Finney milo gave the best yield in the mid-season planting. The *Pythium* root-rot resistant variety Double Dwarf 38 milo heavily out-yielded the ordinary Double Dwarf milo. Beaver milo gave the best results under late planting, up to 1st August. In plantings subsequent to this date, Sooner milo did better than any others under Salt River Valley conditions.
The variety Manko milo gave excellent results when grown for silage purposes. Sixteen selections of this variety were also treated, together with selections of hegari, Fargo and Atlas.

Cotton
Variety trials in 1940 showed that the varieties Delta and Pineland 44–51 out-yielded all others when grown in Upland regions, whilst Coker-Wilds 11 produced the longest fibre but the lowest yields. SxP yielded more heavily than the two other American-Egyptian varieties, P-SxP. (Earlipima) and Pima.
One thousand and three hundred F_2 plants of the Pima-120 cross and 60 plants of the F_1 back-cross, (F_1 Pima x 120) x Pima, were grown with a view to selecting for a combination of fine linting, ability of the boll to hold the seed cotton, and productiveness.
Crosses were made between the *G. barbadense* and Upland cotton hybrids on the one hand, and Hopi x Stoneville hybrids on the other, in an attempt to combine the disease resistance of the *G. barbadense* type with the good quality of the other forms. Strength tests on the Stoneville cotton grown on the Yuma Farm show it to be stronger than any other cotton tested.
The F_6 of the Stoneville x Hartsville cross was grown, and selfed seed obtained from those lines which showed promise.
The progeny of crosses between Santan and many other varieties have been tested with a view to selecting a type possessing better lint and spinning quality than that variety.

Lettuce
Inbreeding with the Imperial 152 and Imperial 615 lines is continuing. Selections were made for resistance to tip burn, bolting and mildew. Observations were also made on U.S.D.A. No. 1–41068M which gives 80–90% of segregates resistant to mildew.

Cantaloupe
A strain of cantaloupe produced originally in a commercial field from a single fruit selection which was subsequently inbred and re-selected, has now been released under the name of Arizona 45. The development of improved strains and selection of hybrids, mainly resulting from a cross between Superfecto and No. 45, is continuing. Nos S5 and S6 seem to be particularly suited for Yuma valley conditions.
Three new strains are ready for field tests: 2–42A, a good quality early type; 6–29A, a vigorous and heavy yielding line; and 3986B, a vigorous grower with heavy yield and high quality.

Soya beans
The work of breeding non-shattering strains was continued in 1940. Of the 450 varieties tested, 25 showed some resistance to shattering, and 30 individual selections have been saved and planted in 1941.
In variety trials Arisoy and Tokio produced the largest yields of forage and seed respectively, out of eight varieties tested. Yield trials of soya beans and hegari, and soya beans and Sudan grass were also carried out.

Castor-oil plant
Varietal tests are reported, the highest yield being obtained from Gilmore Dwarf 52–40.

GENETICS 575.1

774. 575.1
576.356.5
575.182

UMEYA, Y.
(The course of genetics).
Bot. and Zool. 1938 : **6** : 765–71.

Experimental genetics is critically discussed from two aspects as a pure science and as an applied science.
As regards the first, the author believes too much emphasis is laid on the study of chromosomes and Mendelian characters and he points to the views of E. C. Jeffrey, McBride, Wettstein and Serebrovsky as providing a welcome difference of opinion on the paramount importance of the chromosome. The contributions of Goldschmidt, Wettstein, Sirks, Hämmerling and Michaelis

on the study of the gene and the cytoplasm also represent a different and interesting point of view. The writer himself has published some zoological and other work on the importance of the plasma, including its effect upon heterosis.
Experimental genetics may follow two courses: (*a*) the classical, i.e. hybridization, selection and observation of natural mutations; and (*b*) artificial induction of mutation by various means. In the category (*b*) it is in the author's opinion vital to ascertain the kind of relation existing between the artificial and the natural mutation.
The importance of intuition in experimental genetics is exemplified by reference to Burbank and the successful silkworm breeders in Japan, etc.
In conclusion it is recommended that the classical method must never be neglected; interspecific hybridization should be conducted far more extensively; and polyploids (if desirable) should be produced under conditions as nearly natural as possible, in which connexion Schlösser's method of inducing mutations is of special interest (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1389).

775. Stern, C. and
Schaeffer, E. W. 575.113.3
On wild-type iso-alleles in *Drosophila melanogaster*.
Proc. Nat. Acad. Sci., Wash. 1943 : **29** : 361–67.
The term iso-allele is proposed to cover the case of alleles indistinguishable except by special tests. Iso-allely is believed to be of general occurrence in natural populations.

776. Müntzing, A. 575.12
Ras och rasblandning. (**Race and race mixture**).
Tidsspegel 1942 : 144–61.
In discussing the merits and defects of race crossing in human beings it is pointed out that most of the great civilizations of the past have arisen after racial admixture. The prevalence of cross-pollination mechanisms even in hermaphrodite plants is emphasized and wide crossing is not thought to be prejudicial to the race, provided the two elements crossed represent equally high cultural levels.

777. Olenov, J. M. and
Kharmatz, J. S. 575.123:575.113.7:576.12
(**On the origination of obligate heterozygosity**).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 745–47.
Evidence is presented from *Drosophila* studies in support of the theory of the development of obligate heterozygosis in respect of genes, lethal in the homozygous condition.

778. Kisselbach, T. A. and
Petersen, N. F. 575.15:575.242:633.15
Mutations for waxy and sugary endosperm in inbred lines of dent corn.
J. Amer. Soc. Agron. 1944 : **36** : 89–91.
The mutation for waxy endosperm has occurred three times and that for sugary endosperm once, in approximately 100,000 selfs of dent corn. No other visible plant character has been affected, mutated plants being similar to normal plants in all respects but endosperm character. Segregation of waxy and sugary characters was by simple Mendelian inheritance.

779. Rapoport, J. A. 575.17:581.01
(**On the law of expansion and extinction of genic action**).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **31** : 393–96.
By means of tissue transplants in *Drosophila*, the author has demonstrated that the normal phenotypic determination of a particular organ by a gene may be nullified if the rudiment of the organ is grafted into a different morphological environment. Conversely, the genes normally determining the development of the matrix of the graft, may extend their action to regulate the ontogeny of the transplanted tissue. These results are discussed with reference to the concept of gene systems and the significance of such complexes in evolutionary development is stressed.

780. Sonneborn, T. M. 575.182:575.113
Gene and cytoplasm. I. The determination and inheritance of the killer character in variety 4 of *Paramecium aurelia*.
Proc. Nat. Acad. Sci., Wash. 1943 : **29** : 329–38.
A case is described (the killer character in *P. aurelia*) in which the expression of the feature

concerned depends on the interplay of a specific gene and a specific cytoplasmic substrate, neither of which alone is able to determine the relevant character.

781. SONNEBORN, T. M. 575.182:575.24
Gene and cytoplasm. II. The bearing of the determination and inheritance of characters in *Paramecium aurelia* on the problems of cytoplasmic inheritance, *Pneumococcus* transformations, mutations and development.
Proc. Nat. Acad. Sci., Wash. 1943 : **29** : 338–43.

As a result of the findings reported in a previous paper (cf. Abst. 780), the author points out that cytoplasmic inheritance does not necessarily imply the existence of "independent, self-multiplying, cytoplasmic determinants". Cytoplasmic differences may be perpetuated by genes, alike in the two parents and able to determine the continual elaboration of cytoplasmic substances, even although they are unable to initiate the formation of such substances.
Mutation may occur, on the other hand, solely through a change in the cytoplasm, the nuclear genes remaining unaffected.

782. GRANDJEAN, F. 575.22
Les méthodes pour établir des listes de priorité et la concordance de leur résultats. (**The methods for establishing lists of priority and the concordance of their results**).
C.R. Acad. Sci. Paris 1942 : **214** : 729–33.

The author develops his concepts of "force" and "priority" with regard to biological characters. Four methods of determining their value are put forward: comparative ontogeny, comparison of deviations (écarts), comparison of metameres, and phylogenetic determinations.

783. PROKOFYEVA-BELGOVSKAYA, A. A. and
BELGOVSKY, M. L. 575.242:575.116.1
Change in the crossover properties of a chromosome under the influence of mutation.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1943 : **38** : 251–53.

A case is reported in which a *Drosophila* mutation has effected a visible structural change in the salivary chromosomes and has produced a different crossing-over behaviour.

784. RAPOPORT, I. A. 575.243:581.01:581.02
(**Oxidation and the mechanism of action of mutagenous factors**).
J. Gen. Biol. U.S.S.R. 1943 : **4** : 65–72.

Induced mutation rate is proportional to the ionizing capacity of the radiation used and is independent of the wave length. It is therefore concluded that mutation is not a direct effect of the irradiation but results from the action of some intermediate product such as ozone. Iron salts, which are known to have an accelerating effect on the action of ozone, were fed to *Drosophila* larvae, and increased the mutation rate when the resulting flies were X-rayed.
Active forms of oxygen, which are known to be formed during normal metabolism, are thought to be a probable agent in the production of spontaneous mutants.

785. TROFIMOV, I. E. 575.3:575.22:581.14
(**On the increased variation in mutant stocks**).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **33** : 370–72.

The author presents evidence from *Drosophila* studies in support of the hypothesis that underdevelopment of an organism or part of an organism induces a higher rate of variation. Examples are also quoted from the breeding achievements of Uspensky and Michurin who produced winter-hardy varieties by the application of this principle.

786. FREISLEBEN, R.,
MÜLLER, E. A. W. and
SENGBUSCH, R. v. 575.42:581.4:578.08:537.531
Röntgenologische Untersuchungsmethode von Pflanzen und Pflanzenteilen für züchterische Zwecke. (**An X-ray examination method of plants and their parts for breeding purposes**).
Züchter 1943 : **15** : p. 3.

X-ray photography is recommended as a suitable technique for elucidating the morphological and anatomical structure of plant material. It has the advantage of avoiding the necessity of sectioning or otherwise killing selected plants.

787. Tretjakov, D. K. 576.12
(The methods of modern phylogenetics).
J. Gen. Biol. U.S.S.R. 1943 : **4** : 116–28.

The author gives an historical account of the development of the modern phylogenetical standpoint, pointing out the contributions made to it by genetics, physiology and biochemistry; morphological criteria have however remained the primary considerations.

788. Rabaud, E. 576.16:575
La notion d'espèce et la génétique. **(The species concept and genetics).**
Sciences, Paris 1940 : **67** : 85–91.
[From Gartenbauwiss. 1942 : **17** : p. (52)].

The genetical, which takes into consideration the physical-chemical point of view, offers a new and fruitful approach towards a definition of a species. How valuable the morphological characters may be for classification, only the biochemical structure of the organism can show, for in this consists the real difference between various external characters. Only a biochemical analysis is able to explain the conditions for fertile and sterile crosses. Various investigations on plants have up to the present given good results. R. M. I.

789. Camp, W. H. and
Gilly, C. L. 576.16:575.22
The structure and origin of species.
Brittonia 1942 : **4** : 323–85.

The biological species is a kind of natural population, many types of which are to be found. Too narrow a definition of the species would make it almost equivalent to a naturally reproducing genotype while too broad a view would extend the concept to cover all interfertile individuals. The authors propose the following terms to be applied to the various types of species:—
(1) homogeneon: "a species which is genetically and morphologically homogeneous, all members being interfertile".
(2) phenon: "a species which is phenotypically homogeneous and whose individuals are sexually reproductive, but which is composed of intersterile segments".
(3) parageneon: "a species with relatively little morphological or genetical variation throughout its range but which contains some aberrant genotypes; all its individuals are interfertile".
(4) dysploidion: "a species composed of the morphologically similar members of a dysploid series, the individuals of which are sexually reproductive".
(5) luploidion: "a species whose individuals are sexually reproductive and which is composed of segments with a common origin arranged in a euploid series; the segments are morphologically separable although similar in appearance but, because of differential responses in various environmentals, appear to intergrade".
(6) alloploidion: "a species derived by allopolyploidy; its individuals, although usually highly variable, are interfertile".
(7) micton: "a species of wide distribution, the results of hybridization between individuals of two or more species; all individuals are interfertile with themselves and with the ancestral genotypes".
(8) rheogameon (rassenkreis): "a species composed of segments of reasonably marked morphological divergence whose distributions are such that gene interchange may take place in sequence between them; individuals of contiguous segments are interfertile".
(9) cleistogameon: "a species which, in part, reproduces by means of cleistogamy".
(10) heterogameon: "a species made up of races which, if selfed, produce morphologically stable populations, but when crossed may produce several types of viable and fertile offspring".
(11) apogameon: "a species containing both apomictic and non-apomictic individuals".
(12) agameon: "a species consisting of only apomictic individuals".
The concluding sections of the paper deal with the problems arising from the naming of hybrids, from the use of disjunct distribution in assigning specific status, and from the use of subspecific categories.

CYTOLOGY 576.3

790. Straub, J. 576.3:575
Cytogenetik. **(Cytogenetics).**
Fortschr. Bot., Berl. 1941 : **10** : 246–59.
[From Gartenbauwiss. 1942 : **17** : p. (53)].

This report is concerned first with the latest investigations on polyploidy. The problem of the

contrast in performance between the experimentally produced autopolyploids and the natural polyploid forms is discussed and the question of the positive selection value of duplicated genomes which follow therefrom. A study of haploids is also included.
The second problem is the relation between chromosome and gene. The investigations in this connexion include the action of X-rays, an analysis of segmental interchange and chiasma formation as well as the method and influence of crossing-over. The nature of the gene also comes in for discussion. R. M. I.

791. Stuart, N. W. and Emsweller, S. L. 576.312:578.08
Use of enzymes to improve cytological techniques.
Science 1943 : **98** : 569–70.
The enzyme preparation "Clarase" and extracts from the fungi *Aspergillus niger* Van Tieghem, *Chaetomium globosum* Kunze and *Metarrhizium* sp. have been found useful in obtaining clear metaphase configurations.

792. Serra, J. A. 576.312:581.192
Relations entre la chimie et la morphologie nucléaire. (**Relations between chemistry and the morphology of the nucleus**).
Bol. Soc. Brot. 1942 : **16** : 83–135.
In this article, the author reviews current hypotheses on the morphology and biochemistry of the nucleus. The subject of protein structure is treated first, including an account of Wrinch's cyclol theory which however is thought inadequate to cover the known facts. Nucleic acids and their polymerization products are mentioned next and the mode in which these are linked to the protein molecules and the orientation of the conjugated protein so formed are discussed.
After an account of the conclusions to be drawn from ultra-violet photography in respect of nucleic acid distribution in the nucleus, the cytological significance of the salivary chromosomes in the Diptera is evaluated. In his review of theories of mitosis, the author deals with spiralization and the chromosome matrix and proceeds to criticize the extended use of the term heterochromatin. The implication that the latter represents a definite substance is discountenanced as it is thought probable that it refers only to a physiological state of chromatin which may originate from diverse causes.
The function of nucleic acid and its method of synthesis are treated in the final paragraphs, also the conflicting hypotheses as to the biochemistry and morphology of the nucleoli and the SAT regions. The relation of the genes to the nucleoprotein molecules and possible modes of orientation are also mentioned.

793. Sinoto, Y. 576.312.34
(**On the structure of chromosomes**).
Bot. and Zool. 1938 : **6** : 1471–83.
This lecture was largely based on Kuwada's book "The Structure of Chromosomes," in which the theories and discoveries of cytologists in various countries including Japan are reviewed. The subject is discussed under the headings of mitosis and meiosis, specialization and finally the structure of salivary gland chromosomes on which the author himself has been working for some time (cf. "Plant Breeding Abstracts", Vol. X, Abst. 339).

794. Ellenhorn, Ja. E. 576.312.34:576.356.5
(**The genesis of the chromosome complex of *Rhoeo discolor* Hence**).
Doklady Acad. Nauk. S.S.S.R. 1940 : **27** : 361–64.
Differential coloration was observed in *R. discolor* similar to that previously reported in *Gossypium* by the same author (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 228). On this basis, 9 out of the 12 chromosomes are shown to have undergone segmental interchange. Considerable chromosome duplication seems to have occurred in the formation of the species.

795. Sveshnikova, I. N. 576.312.342:578.08
New method for comparative cytological study of species.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **30** : 761–63.
It has been found possible to obtain differential staining of chromomeres by growing roots in a highly aerated medium (saw-dust) and fixing the tips in an equal mixture of platinum chloride and formalin solutions.

796. Skovsted, A. 576.312.35:582:581.9
Chromosome numbers in the *Malvaceae*. II.
C.R. Lab. Carlsberg, Sér. Physiol. 1941 : **23** : 195–242.
Chromosome numbers are listed for species of the following malvaceous genera: *Abutilon, Wissadula, Sphaeralcea, Modiola, Lavatera, Althaea, Malva, Sidalcea, Napaea, Malvastrum, Sida, Bastardia, Anoda, Malachra, Urena, Pavonia, Typhalaea, Hibiscus, Hibiscadelphus, Kosteletzkya, Thespesia, Cienfuegosia, Kokia* amd *Gossypium*. The taxonomic conclusions inferred from these observations are discussed and a few changes in the status of certain species are proposed. Polyploidy has played an important part in the evolution of the group and several cases of intraspecific polyploid series are quoted. In *Urena lobata*, the tetraploid variety is adapted only to tropical conditions; its diploid counterpart, however, will grow both in temperate climates and in the tropics. The author believes that the present-day distribution of the species of *Gossypium* and allied genera is evidence for the previous existence of land bridges across the Pacific Ocean.

797. Murneek, A. E. and 576.354.46:581.1
Wittwer, S. H. 576.37:581.1
Synapsis and syngamy as stimulating processes of plant development.
Science 1943 : **98** : 384–85.
The authors report that accelerations of metabolic processes accompany both chromosome conjugation during meiosis and sexual fertilization.

798. Blakeslee, A. F. 576.356:576.12
Induced evolution in plants through chromosome changes.
Proc. 8th Amer. Sci. Congr. Wash. 1940 : **3** : p. 173.
The ways in which chromosomal aberration may lead to new true-breeding types are discussed. Chromosome doubling is the most important of these effects and has played a significant role both in the evolution of species and in the production of valuable breeding types.

799. Panshin, I. B. 576.356.2
Relative frequency of union of chromosome fragments.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **33** : 320–22.
Single chromosome breaks are almost invariably followed by reunion in the original configuration. In the case of double breaks, the union of two fragments to form a new structure increases the probability of the corresponding union of the other two fragments.

800. Dubinin, N. P.,
Khvostova, V. V. and 576.356.2:537.531
Mansurova, V. V. 575.243:537.531
(Chromosomal aberrations, lethal mutations and X-ray dosage).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **31** : 387–89.
An analysis of the results obtained from subjecting *Drosophila* to X-radiation has shown that the induction of lethal mutations is directly proportional to the dosage. Induced chromosomal aberrations are not proportional to the square of the dosage and the reasons for this are discussed. The number of breaks per chromosome is directly related to chromosome length but the breaks are not distributed at random, being more concentrated in the inert regions, the distal portions, and in certain small sections possibly originating from duplication.

801. Swanson, C. P. 576.356.2:537.531:535.61–31
X-ray and ultraviolet studies on pollen tube chromosomes. I. The effect of ultraviolet (2537 A) on X-ray-induced chromosomal aberrations.
Genetics 1944 : **29** : 61–68.
Pre-treatment with short wave length ultra-violet irradiation (2537 Å), one hour before X-raying, led to an inhibition of all types of visible X-ray breaks in *Tradescantia*, single deletions and translocations being more affected than double deletions. The degree of inhibition increased with the dose of ultra-violet light, but the exact proportionality was not worked out.
Post-treatment had no inhibitory effect upon double deletions, while translocations were inhibited if the dose was given up to half-an-hour after X-irradiation; single deletions were inhibited by pre-treatments up to one hour after X-irradiation.

It is suggested that the action of the ultra-violet irradiation is only effective after a time interval, and also that the inhibition results from an effect produced on the chromosome matrix which leads to its greater resistance to X-ray breakage.

802. Sidorov, B. N. 576.356.2:575.115:575.17
(Study on the nature of changes caused by structural chromosome mutations).
C.R. (Doklady) Acad. Aci. U.R.S.S. 1941 : **31** : 390–92.

The author reports the results of *Drosophila* studies on the position effect. Chromosomal rearrangements were induced by X-irradiation and several of the resulting types were found to differ from the original in the dominance relations of the gene considered. Point mutations of the same gene produced different phenotypes from the forms with chromosomal alterations and this finding is held to refute the theory that hereditary variation is only caused by structural changes in the chromosomes.

803. Taylor, H. 576.356.5:581.1
A physiological study of diploid and related tetraploid plants.
Proc. Okla. Acad. Sci. 1942 : **22** : 137–38.

Diploid and tetraploid forms of *Vinca rosea* and *Petunia violacea* are compared in respect of their physiological characteristics, in particular, those affecting water relations.

SEXUALITY 577.8

804. Jones, K. L. 577.8:575.182:575.127.2
Studies on *Ambrosia*: III. Pistillate *Ambrosia elatior* x *A. trifida* and its bearing on matroclinic sex inheritance.
Bot. Gaz. 1943 : **105** : 226–32.

The author describes a case of matroclinous sex inheritance in the cross *A. elatior* x *A. trifida*; the evidence to hand suggests that sex expression is determined by a complex of quantitative genes.

BOTANY 58

805. Rapoport, I. A. 581.04:581.143
(Substances which destroy the symmetry of the organism).
Doklady Acad. Nauk. S.S.S.R. 1940 : **27** : 370–73.

Certain therapeutic chemicals such as *p*-aminophenol, hydroquinone, and *p*-phenylendiamine, when administered to *Drosophila melanogaster* in sub-lethal doses, were capable of producing asymmetrical growth such as *abdomen rotatum*, some compounds producing dextro-rotation and others laevo-rotation.

806. Olmsted, C. E. 581.143.26.035.1:633.287
Growth and development in range grasses. III. Photoperiodic responses in the genus *Bouteloua*.
Bot. Gaz. 1943 : **105** : 165–81.

Species and strains of *Bouteloua* exhibit significant differences in photoperiodic sensitivity.

807. Hecht, A. 581.162.52:575.11:576.356.5
Induced tetraploids of a self sterile *Oenothera*.
Genetics 1944 : **29** : 69–74.

"Tetraploidy has been induced in a self sterile race of *Oenothera rhombipetala* by treatment with colchicine. An analysis of the inheritance of the self sterility alleles in the tetraploids revealed a self sterility mechanism based upon opposing sterility alleles according to the general scheme of East and Mangelsdorf. Successful matings resulted only when the potential seed parent contained none of the self sterility alleles present in the pollen. The situation is satisfactorily explained by assuming that the original diploid plants which became tetraploid following colchicine treatment differed from each other by only a single self sterility allele".

808. Satô, D. 581.163:578.08
(Artificial parthenocarpy).
Bot. and Zool. 1938 : **6** : 2051–54.

According to the author, S. Yasuda was the first to induce artificial parthenocarpy (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 810).
The work of Gustafsson and of Gardner and Marth on the subject is also discussed as well as Suita's work (1938) on parthenocarpy in cut flowers which was to be more fully reported at a later date.

809. Smith, F. H. 581.331.1
Megagametophyte of *Clintonia*.
Bot. Gaz. 1943 : **105** : 263–67.
Aberrant megasporogenesis in the genus *Clintonia* is confirmed. The three cells at the chalazal end of the megaspore mother-cell degenerate into densely chromatic masses which become included in the embryo-sac where they may fuse with each other.

810. Epling, C. 582:001.4
Taxonomy and genonomy.
Science 1944 : **98** : 515–16.
The term *genonomy* is proposed to cover the study of the "familial relationships of the individuals which comprise a species".

PLANT DISEASES AND PESTS 632

811. White, O. E. 632.1–1.521.6:581.9
Temperature reaction, mutation and geographical distribution in plant groups.
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 287–94.
Evidence is presented to support the conclusion that many species are heterogeneous in respect of susceptibility to heat or cold. The importance of this finding for evolutionary theory and plant geography is discussed.

812. Yamasaki, M. 632.19–1.521.6:581.04:635.9
(A preliminary note on the detection of single-flowered and double-flowered plants by testing their resistance to the toxic action of $KClO_3$).
Plant Breed. News 1934 : **9** : 762–64.
From experiments with various flowering plants it appeared that double-flowered forms are more resistant to $KClO_3$ than single-flowered plants and the distinctive reaction can be obtained with seedlings or with leaves and young shoots. Results with *Mathiola incana* are illustrated.

813. Dodge, B. O. 632.4:575.1
Genetic interpretations of cultural variations in the fungi.
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 199–206.
The author reviews recent work on induced variation in the fungi. Cultural studies have provided a wealth of material for the geneticist, as have researches on physiological races and heterothallism.
Many unsolved questions have arisen as a consequence of such work. It is not known whether the high mutation rate of haploid cultures is also characteristic of wild strains and it is doubtful whether the small chromosomes of the fungi are capable of carrying the large number of genes which are presumed to differentiate between the numerous mutant biotypes.
Anomolous linkage relations may be explicable on the assumption of delayed reduction division, and although it has been stated that some of the chromosomes are too small to cross-over, it is believed that they may be able to do so in the four-strand stage.
Cytoplasmic inheritance may be of considerable importance.
The concepts of haploidy and diploidy cannot be applied to the fungi without further definition. The pseudodiploidy of dicaryotic mycelia should be distinguished from true diploidy and it is important to realize that the notion of dominance has also a modified meaning when applied to the heterocaryotic hyphae formed after hydridization.

814. Berkeley, G. H. 632.4–1.521.6:633:581.192
Root-rots of certain non-cereal crops.
Bot. Rev. 1944 : **10** : 67–123.
A review of the present state of knowledge of non-cereal root rots is presented. The more important parasites attacking woody perennials, tobacco, cotton, sugar beet, leguminous crops, sugar cane, sorghum, pineapple, flax, ginseng, strawberries, raspberries, vegetables and ornamental plants are described, and an account is given of the effects of temperature and edaphic factors. Methods of control are outlined.
Varietal resistance is recorded for tobacco, strawberries, sweet clover, lucerne, sugar cane, vetches, peas, walnuts and pineapple. It is mentioned that resistance may be associated with the presence of toxic substances, e.g. phenolic derivatives and alkaloids.

815. Goodspeed, T. H. 632.421.9:575.243:537.531
Experimental induction of heritable and other alterations in the fungus *Neurospora tetrasperma*.
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 223–29.
The effects of heat treatments, Grenz radiation, X-rays, neutron bombardments and combinations of these treatments on *N. tetrasperma* are described. A list of the characters affected is given and the hereditary nature of some of the variations is indicated. Contrary to expectation, it was found that X-rays with the longer wave lengths were less effective in inducing variation than short wave irradiations. Significant χ^2 associations were determined between conidiospore formation, ascospore formation, frequency of perithecia, sclerotia production, and colour and type of surface growth. The degrees of association were modified by the treatments described.

816. Spiegelman, S.,
Lindegren, C. C. and
Hedgecock, L. 632.422.3:575.3:575.22
Mechanism of enzymatic adaptation in genetically controlled yeast populations.
Proc. Nat. Acad. Sci., Wash. 1944 : **30** : 13–23.
A method has been elaborated in order to test the genetical homogeneity of yeast cultures and this has been applied to the problem of adaptability of yeast to galactose fermentation. Diploid yeast strains are more stable than haploid and the lag shown by the former in acquiring the ability to ferment galactose has been confirmed.

817. Lindegren, C. C. and
Lindegren, G. 632.422.3:581.162.5:575.12
A new method for hybridizing yeast.
Proc. Nat. Acad. Sci. Wash. 1943 : **29** : 306–08.
It has been found possible to hybridize by simple admixture, strains of *Saccharomyces cerevisiae* in which the ascospores germinate to give persistent haploid cultures. Copulation results when complementary types are intermixed. Four haploid cultures were obtained from the four ascospores of one ascus, two of which were complementary to the other two.
Copulation tubes have also been observed between round-celled members of the genus *Torula*.

818. Lindegren, C. C. and
Lindegren, G. 632.422.3:581.162.5:582:001.4
Segregation, mutation, and copulation in *Saccharomyces cerevisiae*.
Ann. Mo. Bot. Gdn 1943 : **30** : 453–63.
The formation of haploid cultures of *S. cerevisiae* is discussed and the incompatibility mechanisms regulating copulation described. Haploid cultures are generally "rougher" and weaker than the parent diploids and the genetical basis of the different "rough" types is considered. Copulation is determined by the interaction of the two alleles a/*a* and also by the superimposed action of modifying factors.
Torula (= *Torulopsis*) and *Zygosaccharomyces* are probably invalid genera, being only stages in the life cycle of *Saccharomyces*.

819. 632.8:633(47)
(Plant virus diseases and their control. Transactions of the conference on plant virus diseases. Moscow, 4–7 February, 1940).
Microbiol. Inst. Acad. Sci. U.S.S.R. 1941 : Pp. 340.
This monograph embodies the thirty-seven papers presented at the conference on virus diseases held in Moscow on 4th to 7th February, 1940, and gives a comprehensive picture of the investigations on plant viruses then in progress in the U.S.S.R. The earlier papers are devoted to general topics, the later ones to problems concerned with special crops. The so-called pseudo-rosette disease or "zakuklivanie" of cereals has been traced to a virus and its insect vector (*Delphax striatella*) has been found; the same applies to the "big bud" of tomatoes. The virus content of potatoes has been shown to be materially reduced by Lysenko's method of summer planting.

Plant breeders will be mainly interested in the following papers:—

Vovk, A. M. (*New data on "zakuklivanie" of different cereals and their hybrids*). (*pp. 82–106*).

The influence of various cultural measures such as mulching on the pseudo-rosette disease or "zakuklivanie" of oats was studied and observations were made on the incidence of the disease in other cereals. Different varieties exhibited different degrees of susceptibility. No immune forms were found among a large number of winter and spring wheat varieties examined but certain spring wheats at least showed a high degree of resistance; Lutescens 0956, Caesium 0111, Smena 01021, Leucurum 05383 and wheat hybrid 94/14530 were the most resistant.

Over 1000 barley varieties were examined but no immune forms were discovered, though the degree of infection and type of symptoms differed in different varieties; Boec 0945 was the most resistant, closely followed by Europaeum 0353/133.

Rye was much more resistant but the wheat-rye hybrids were as susceptible as the ordinary wheat varieties.

No infection has yet been observed on *Agropyron glaucum* and *A. elongatum*, and the *Triticum-Agropyron* hybrids produced by Cycin [Tzitzin] were mostly resistant in the F_1 to F_3 generations; later generations up to F_{10} contained both resistant and susceptible forms: the wheat-like segregates included both susceptible and resistant forms, the wild types were mostly resistant. The back-cross hybrids with wheat were largely susceptible, even in the early generations. The perennial hybrid 34085 was the most resistant; these resistant segregates are thought to be of probable value in breeding resistant forms of wheat.

Grebennikov, S. D. [*The pseudo-rosette disease ("zakuklivanie") of oats in Siberia and measures for controlling it*]. (*pp. 107–19*).

The influence of various cultural and other factors on the development of the disease was studied. Varietal differences were found to be less pronounced than differences resulting from environmental causes. A close correlation was observed between degree of tillering and degree of infection, and some of the oats bred in Siberia such as Omsk 2136 and Omsk 2721 proved somewhat less susceptible for this reason.

Hairullin, Š. Š. (*Control of "zakuklivanie" of oats and barley in eastern Transbaikal*). (*pp. 140–44*).

In discussing the various measures of control of the disease it is pointed out no truly resistant varieties have yet been found, and that varieties which in certain seasons have been reported as resistant may be badly attacked in others. *Avena nuda* is the most susceptible of all, and is followed by *A. byzantina*, *A. strigosa*, *A. brevis*, *A. fatua* and *A. sativa*. A certain degree of resistance has been detected in *A. volgensis* and this may be a possible parent for use in breeding resistant varieties.

All the eighty varieties of barley investigated have proved susceptible, the nearest approach to resistance being observed in some var. *deficiens* forms from Abyssinia and Eritrea.

Rusakov, L. F. (*Comparative susceptibility of cereal varieties to virus diseases*). (*pp. 145–52*).

The various factors influencing the degree of infection are examined. No variety with a really high degree of resistance was found, though certain varieties were undoubtedly more resistant than others; in 1938 the best of these were Stepnjak, V N–1 and Vydviženec in Siberia, and Stepnjak, von Lochow's, Magistral and Golden Rain in European Russia. Late maturing varieties were on the whole attacked less than early varieties.

Zaružilo, V. K. and Sitnikova, G. M. (*Mosaic of wheat and other cereals, the damage caused by it and methods of dissemination in nature*). (*pp. 153–64*).

General observations have been made on the nature and incidence of the disease, which has been shown to be transmitted by *Deltocephalus striatus* L. None of the commonly grown wheat varieties have shown any resistance, but some varieties in the collection have remained healthy whilst the neighbouring varieties were badly infected and these varieties may possibly be of use in breeding for resistance.

The best measures for combating the disease in the absence of resistant varieties are discussed.

Rjahovskiĭ, N. A. (*Mosaic of winter wheat according to observations at the Ramonj breeding station*). (*pp. 165–69*).

Data are given showing the extent of the damage that may be occasioned by the mosaic virus in wheat; the disease has also been observed on winter rye and millet.

The influence of time of sowing and manuring was observed. Varietal differences in degree of susceptibility were found too, and though no forms were immune, some appeared to be highly resistant.

Brojakovskiĭ, N. V. (*Observations on a new disease of winter wheat mosaic*). (*pp. 170–72*).

The symptoms of the disease are described. The variety Kievljanka 156 is reported as the most resistant.

Moskovec, S. N. (*The virus disease of cotton and measures for controlling it*). (*pp. 173–90*).

The virus disease affecting cotton in Azerbaijan, though having a certain number of features in common with the leaf curl found in the Sudan, attacks different varieties and seems to be due to a different pathogen, whose chief vector is *Aphis gossypii*. The influence of sowing and other conditions is discussed. Several resistant varieties have been selected; these include Giza 7 and 3782-1 from Giza 12 among the Egyptians, and No. 1, No. 2 and No. 7 among the Sea Islands. Since Azerbaijan is the only area in the U.S.S.R. where the virus has so far been found, tests of varieties and hybrids are concentrated there and a large number of the promising new varieties from other breeding stations are tested there every year. The varieties most resistant to virus have also proved resistant to gummosis.

Some of the new resistant hybrids are extremely promising; No. 75 has never been infected at all, and Nos 348 and 377 combine a fairly high degree of resistance with excellent agricultural and industrial qualities.

Various other methods of control are also suggested.

Ternovskiĭ, M. F. (*Interspecific hybridization for controlling tobacco mosaic*). (*pp. 219–26*).

Having examined 711 tobacco varieties and found none to be resistant, crosses were started in 1938 with Ambalema, one of the resistant varieties introduced from America.

Crosses were also made with *Nicotiana glutinosa*; an amphidiploid was obtained from the sterile F_1 and from this a sesquidiploid with 60 chromosomes (12g + 24tt) was formed by back-crossing with *N. Tabacum*. The sesquidiploid resembled its cultivated parent, Dubec 44, in appearance but was very much inferior in quality. It was mosaic resistant on account of a spot necrotic reaction of the type found in the *N. glutinosa* parent. In back-crosses with *N. Tabacum* the proportion of necrotic plants varied from 22 36·8%, while in selfed progenies the proportion varied from 44·2 to 69·6%. The deviations from Mendelian ratios are ascribed to elimination of certain chromosomes, gametes or zygotes.

Spontaneous sesquidiploids were obtained in 1939 from the crosses Trebizond x *N. glutinosa* and Dubec x *N. glutinosa*, both evidently arising through fertilization by an unreduced gamete of *N. glutinosa*. In the selfed progenies of these sesquidiploids the proportion of necrotic plants never exceeded 27%. The higher proportions in the first sesquidiploids are thought to result from the greater meiotic regularity of the amphidiploid hybrid from which they were obtained.

In the third generation hybrids from the original sesquidiploid, no family was found to be constant for necrotic reaction. Some families, varying from 6% to 16% of the whole, segregated regularly into 3 necrotic: 1 susceptible; these families had regular meiosis. The other families showed varying degrees of irregularity, which moreover they maintained even up to the eighth generation. Some families had as many as 95–98% necrotics, owing to the presence of 2 extra chromosomes belonging to the necrotic genome.

From the families with regular segregation, certain segregates were obtained which were identical with Dubec 44 in everything but the possession of the necrotic reaction, for which they bred true. The necrotic reaction was also transmitted to other tobacco varieties by crossing them with the regularly segregating lines.

Great variations in quality and aroma were observed in the segregates but some of the necrotic types obtained were equal to Dubec 44 and some even slightly superior in aroma. Some also exceeded Dubec 44 in yield, matured earlier and were resistant to root rot.

The immune forms obtained in this way have been crossed with all the main cultivated tobaccos such as Samsun, Tyk-Kulak and Trebizond and immune hybrids of all the main types equal to the susceptible forms in yield and quality have now been produced. Dubec forms combining mosaic resistance with immunity to mildew have been obtained from the same crosses and these too are equal to Dubec 44 in aroma.
About 10,000 plants from the cross with Ambalema were examined for mosaic resistance and all susceptible plants were discarded; some 300 were retained. Only eight however failed to produce symptoms when inoculated with sap from necrotic *N. glutinosa* hybrids.

Poner, V. M. (*Susceptibility to big bud of different solanaceous species and hybrids*). (*pp. 227–44*).

The reaction of 33 solanaceous species and varieties to big bud was investigated. *Solanum nigrum* showed a high degree of resistance, with an exceedingly long incubation period, lasting sometimes up to four and a half months; the symptoms produced were much less pronounced than in tomatoes. The disease was transferred to various domestic potato varieties by grafting, one of the symptoms being the production of aerial tubers and a reduced quantity of underground tubers.
No symptoms were produced by artificial infection of tobacco (variety Trebizond 709), *Nicotiana glutinosa, Petunia, Physalis, Datura arborea* and *Capsicum annuum*. Infections were produced on *Solanum Dulcamara, S. Melongena, Datura Stramonium* and *Atropa Belladonna*. Differences in susceptibility were observed in different varieties of tomato.

Koračevskiĭ, I. K. (*The search for measures of control of big bud in vegetables*). (*pp. 255–63*).

Among tomatoes, the varieties Bison and Stone have proved less susceptible than the popular variety Market Wonder and the use of these varieties is recommended. Another possible method of control proposed is vegetative hybridization with immune solanaceous species such as the Mexican tomato, the potato (Early Rose and Epicure), *Nicotiana glauca, Capsicum annuum, Solanum Melongena* (var. Bulgarian 14) and *S. nigrum*; the two latter species can be infected artificially but are immune in the field.

Serebrjakov, A. I. (*Big bud of tomatoes in the canning factory zones of the Krasnodar region*). (*pp. 272–77*).

The characteristics of the disease are described. The most resistant varieties have proved to be the upright or standard varieties of the *validum* group, such as Feodosia Stone, Kuban Hybrid 252, Planovyi and Kuarter-Centri [Quarter Century?].

Krivin, B. G. [*Varietal resistance of potatoes to* Solanum *virus* 2 *Orton when transmitted by the aphis* (Myzodes persicae *Sulz*)]. (*pp. 326–32*).

Tests were made with fifteen standard varieties, plants of which were subjected to infection by the aphis. The early varieties were the most susceptible and the most resistant were Wohltmann, Dutch, Lorch, Merker and Millet's Pink.

ECONOMIC PLANTS 633

820. 633.00.14(48.5)
633:575.3(48·5)

*Odlingsvärdet i olika landsdelar hos våra viktigaste sorter och stammar av vårsådda åkerbruksväxter—korta översikter. (**Suitability in different parts of the country of our most important varieties and strains of spring sown agricultural crops—brief surveys**).
Sverig. Utsädesfören. Tidskr. 1942 : **52** : 4–44.

This paper comprises a series of detailed reports on the performance in local trials in various parts of Sweden of varieties bred or selected in recent years.* Their suitability and value for different areas is also recorded.

* An extended summary of this paper is on file at the Bureau.

821. TERAO, H. and KONDO, Y. 633.1:575:578.08
(Seedling test as a plant breeding technique).
Plant Breed. News 1935 : **10** : 815–25.

This article describes how seedlings can be tested under various conditions of temperature, light and moisture in order to detect certain morphological and physiological features of different varieties of rice, barley or wheat.

822. TERAO, H. and IKEDA, T. 633.1:581.481
(Twin-budded plants of wheat and barley).
Plant Breed. News 1934 : **9** : 751–55.

Various types of twin-budded seedlings of the two cereals are illustrated. Some resulted in twin seedlings, others in triple seedlings. It is thought probable that some instances of the "polyembryony" observed by Komuro (1922) and Jones (1928) in rice might well be similar cases to those here described.

823. PACKARD, C. M. 633.1–2.7–1.521.6:575
Insect enemies of our cereal crops.
Rep. Smithson. Instn. 1942 (1943) : 323–38.

This article includes a short mention of the achievements of plant breeders in producing insect-resistant cereal varieties.

824. 633.1:664.641.016:575(43)
Qualitätszüchtung bei Weizen und Roggen. **(Breeding for quality in wheat and rye).**
Forschungsdienst 1943 : **15** : p. 106.

In this brief note on the address given in Berlin by P. Pelshenke, director of the Reichsanstalt für Getreideverarbeitung [Government Institute for the Milling Industry], on the "Aims, Methods and Achievements in Breeding for Quality in Wheat and Rye" the importance was stressed of breeding for quality, which will ensure not only a good loaf but also a higher output of flour and bread.

The improvement of quality in wheat and rye by breeding calls for close co-operation between science and practice, i.e. between plant breeding, practical agriculture, milling, baking and health authorities.

WHEAT 633.11

825. ALBERTS, H. W. 633.11(85)
Wheat in Peru.
Agric. Amer. 1943 : **3** : 233–35.

A general description is given of wheat growing in Peru. Most wheat is grown under primitive conditions and the climate tends to favour soft wheats. The principal varieties of hard wheats grown are Mentana (Italian), Marquis, Spring Progress, Red Manitoba and Hungarian. Diseases (mainly rusts) cause serious damage in some years and the weather often makes the crop a gamble. Nevertheless the Government is endeavouring to encourage production by the distribution of new varieties and other means.

826. 633.11:575(49.4)
WAGNER, S. 633.14:575(49.4)
Der heutige Stand der Getreidezüchtung in der Schweiz und Vorschläge für deren Ausbau. **(The present position of cereal breeding in Switzerland and proposals for its extension).**
Ber. Schweiz. Bot. Ges. 1943 : **53** : 299–312.

This paper deals mainly with suggestions for a co-ordinated scheme of cereal breeding in Switzerland. It is pointed out that most of the desirable characters for a good wheat variety are contained either in Monte Calme 245 or in Plantahof 3 or in both. By large scale hybridization of these or similar varieties, it should be possible to produce a new variety combining the good qualities of both.

Rye breeding is more difficult than wheat breeding on account of the obligate cross-pollination in this species. Some progress has been made however towards the production of a superior generally adaptable variety and a gradual increase in the 1000-grain weight of present breeding lines has also been obtained.

827. Terao, H. and Kondô, Y. 633.11:575.061.1:578.08
(Varietal characteristics revealed on etiolated seedlings of wheat).
Plant Breed. News 1934 : **9** : 551–52.

A drooping habit, observed 6 days after germination in three out of twelve varieties tested, might help to detect other important hereditary characters at an early stage.

828. Marinič, P. 633.11:575"793"(47)
(Early maturing spring wheat varieties for the east).
Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture) Moscow 1942 : No. 4 : 54–56.

The variety Severjanka [Northerner] ripens 2–3 days earlier than Garnet, yields equally well, is free from shedding and lodging and resistant to yellow and brown rust and loose smut. Other promising early varieties are Thatcher, Washington, Albidum 3700 and Lutescens 62.

829. 633.11:575"793"(47)
Plotnikov, N. 633.11:575.127.5:633.289(47)
(Introduction of new varieties of spring wheat in the east).
Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture) Moscow 1942 : No. 12 : 16–19.

The late maturity of most of the spring wheats at present grown in Siberia creates an enormous pressure of work at the end of the season. The cultivation of varieties which ripen at different times would serve to relieve this pressure and a number of suitable varieties are described. These include Milturum 553, a late type and among the mid-earlies Albidum 3700, Lutescens 956, the American variety Washington and two *Triticum-Agropyron* hybrids. Both these hybrids have out-yielded the commonly grown wheat varieties in many parts of the eastern U.S.S.R. and especially Siberia, where they ripen a fortnight or more earlier than Milturum 321. In some years they equalled or exceeded Milturum 321 in yield, but in 1941, when they ripened 16 days earlier, their yield was 4 c. per ha. less. The baking quality and grain size of the hybrids was good and they displayed moderate resistance to loose smut and brown rust.
The best early varieties are Garnet and the two new varieties Severjanka [Northerner] and Udarnica [Shock-worker]. Severjanka is a selection from a cross of Marquis x a local Siberian wheat and ripens 2–3 days earlier than Garnet. Udarnica, a variety selected by the Tulun breeding station, ripens 3 days before Garnet and is free from shedding and lodging.

830. 633.11:575.127.5:633.11*Aegilops*:576.354.4
Sears, E. R. 633.11:575.129:633.11*Aegilops*:576.354.4
The amphidiploids *Aegilops cylindrica* x *Triticum durum* and *A. ventricose* x *T. durum* and their hybrids with *T. aestivum*.
J. Agric. Res. 1944 : **68** : 135–44.

Amphidiploids of the hybrids *Ae. cylindrica* x *T. durum* and *Ae. ventricosa* x *T. durum* were produced by colchicine treatment.
Bivalent formation in both amphidiploids was low, and fertility was very much reduced, especially in the *Ae. cylindrica* x *T. durum* hybrids.
Evidence is presented from the results of crossing the amphidiploid hybrids with *T. vulgare* to show that the chromosomes of *Ae. cylindrica* are homologous with the C set of *T. vulgare*. The homology of *T. vulgare* is not so well marked with *Ae. ventricosa* and is thought to be confined to one or two chromosomes only.

831. Lein, A. 633.11:575.127.5:633.14:581.162.5:575.11
Die Wirksamkeit von Kreuzbarkeitsgenen des Weizens in Kreuzungen von Roggen ♀ mit Weizen ♂. **(The effectiveness of wheat crossability genes in crosses of rye ♀ with wheat ♂).**
Züchter 1943 : **15** : 1–3.

By crossing Petkus winter rye (♀) with Marquis and Chinese 466 wheats (♂), the author was able to study the action of the genes kr_1 and kr_2 carried by Chinese 466. These genes, which promote the facility of intergeneric hybridization in the reciprocal cross, are also effective in the reverse combination.

832. 633.11:575.129

A giant-grained hybrid wheat.

Science Suppl. 1944 : **99** : 10–12.

Two amphidiploid wheat varieties are reported. *T. sovieticum* ($2n = 56$), derived from *T. durum* x *T. Timopheevi*, has large kernels and is also resistant to most fungus diseases. An amphidiploid ($2n = 70$) has also been obtained from *T. Timopheevi* x *T. vulgare*.

833. Isikawa, K. 633.11:575.242:575.114

(Occurrence of speltoid mutants in some Japanese varieties of wheat, and their genetic traits, I, II).

Plant Breed. News 1934 : **9** : 1361–71; 1566–71.

An account is given of spontaneous speltoid mutants similar to the types described by Nilsson-Ehle, Lindhard, Kajanus and others, with notes on their genetic traits and mode of segregation of the three types Sp. I, Sp. II and Sp. III.

Sp. III was observed to occur sometimes in series of strains belonging to the group Sp. II.

The Japanese wheats Sirokomugi No. 1 and Hayakomugi showed respectively 0·08% and 0·06% speltoid mutants in their progeny, while in the progeny of the normal homozygote that segregated out from the heterozygous speltoid of the variety Sirokomugi No. 1 the percentage was 0·38.

834. Isikawa, K. 633.11:575.242:575.114

(Occurrence of speltoid mutants in some Japanese varieties of wheat, and their genetic traits, III).

Plant Breed. News 1934 : **9** : 2244–47.

In continuation of this study (cf. Abst. 833), compactoids are recorded as segregating out occasionally among the progeny of the heterozygous speltoids, as in Lindhard's instances, and their genetic behaviour as well as that of the dwarf compactoid derived from the compactoid form also seems to agree with the reports of earlier workers.

In a large group of strains from heterozygous speltoids, awnless red-glumed, late maturing or long stemmed mutants and some mosaic forms were discovered.

835. Namikawa, S. and Kawakami, Z. 633.11:576.356.5:581.481:581.162

(The change of chromosome number in twin-seedlings of common wheat).

Plant Breed. News 1934 : **9** : 2241–44.

In F_3 and F_4 families of intervarietal crosses of *Triticum vulgare* twin seedlings differing from each other in their chromosome number were found.

Out of 29 twins, 19 were ordinary diploid pairs and the rest showed the following three types of association. In one case, a diploid partner having 42 chromosomes with a haploid having 21 chromosomes; in 8 cases, a diploid seedling with a triploid (63 chromosomes); and in one case a diploid seedling with a tetraploid (84 chromosomes).

Some morphological differences from the diploids were noted in the haploid and polyploid forms. As compared with the fertility of the diploid (taken as 100%) the haploid showed 2% fertility, the triploid 10 (0·4–47·2)% and the tetraploid 80%.

836. Yamasaki, Y. 633.11:576.356.52

(Haploid plants of common wheat).

Plant Breed. News 1934 : **9** : 156–57.

An illustrated note on three haploid *Triticum vulgare* plants found in strains from varietal crosses is given (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 842).

837. Kostoff, D. 633.11:576.356.52:575.116.1

Haploide *Triticum vulgare* und die Variabilität ihrer diploiden Nachkommenschaften. (**Haploid *Triticum vulgare* plants and the variability of their diploid progenies**).

Züchter 1943 : **15** : 121–25.

By emasculating wheat plants, an increase in the frequency of haploid embryo production has been induced. At meiosis, the haploid pollen mother-cells may exhibit univalents only but a single bivalent is formed in several cases and occasionally two. A few diploids are produced from

selfed haploids through the formation of restitution nuclei. These, however, are not necessarily homozygous as crossing-over may lead to structural hybridity. Cytological examination of the diploids thus obtained shows that trivalents or quadrivalents are sometimes formed at meiosis and a segregation of morphological and physiological characters occurs in some of the progenies. It is believed that some of these segregates may furnish useful breeding material. A comparison is drawn between the cytology of haploids and intergeneric hybrids.

838. NAMIKAWA, S. 633.11:581.144:575
(Occurrence of a specially vigorous type of wheat).
Plant Breed. News 1934 : **9** : 756–58.
In the F_3 of a cross Kinai 114 x Kônosu 26, a strain F_3 94 was found which was so vigorous and bore so many tillers that it could be clearly distinguished at an early stage from the ordinary type of wheat. It should be of special interest for plant breeders.

839. MCCLUGGAGE, M. E. 633.11:581.6
Factors influencing the pearling test for kernel hardness in wheat.
Cereal Chem. 1943 : **20** : 686–700.
Pearling tests on six varieties of hard red winter wheat showed that kernel hardness was determined both by the variety and the variety environment.

840. SWANSON, C. O. 633.11:581.6:581.032
Effects of moisture on the physical and other properties of wheat. IV. Exposure of five varieties to light rains during harvest.
Cereal Chem. 1943 : **20** : 703–14.
Five wheat varieties, Early Blackhull, Kanred, Tenmarq, Blackhull and Chiefkan were tested for their ability to withstand the effect of light rains during the harvesting season. Precipitation tended to change the endosperm from a vitreous to a mealy consistency. Early Blackhull and Blackhull were the most affected, whilst Chiefkan was the least altered; Kanred and Tenmarq were intermediate in reaction.

841. WALDRON, L. R. 633.11–1.557(78.4)
Study of two hard red spring wheat varieties grown comparably but differing in kernel weight.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1943 : **6** : No. 1 : 25–30.
A large-grained wheat hybrid 2812 was compared with the small-grained variety Thatcher in yield trials under different methods of sowing. In every case the new hybrid 2812 was superior to Thatcher in its yield.

842. 633.11–2.421.1–1.521.6:575.127.2
ZHEBRAK, A. R. 633.11:575.129:581.04
(Production of *T. persicum* x *T. Timopheevi* amphidiploids).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1941 : **31** : 485–87.
A 56-chromosome amphidiploid, resistant to *Erysiphe graminis*, has been produced by colchicine treatment of the hybrid *T. persicum* x *T. Timopheevi*. The morphological characters of the new form are described and it is classed as a variety of *T. soveticum*.

843. OLÁH, L. VON 633.11–2.452:576.16:631.521.6:575.11
Über die Vererbung der Gelbrostresistenz bei verschiedenen Weizensorten.
(On the inheritance of yellow-rust resistance in different wheat varieties).
Z. Zücht. A. 1938 : **22** : 45–74.
The main substance of this paper has already been reviewed in "Plant Breeding Abstracts", Vol. XII, Abst. 1046.

844. KIHARA, H. 633.11*Aegilops*:575.127.2:581.46:575.115
(Genetics of interspecific hybrids).
Kagaku (Science) 1939 : **9** : 454–60.
The author has made a study of the awn type in *Aegilops* species and in interspecific hybrids obtained from various hybrid combinations of *Ae. umbellulata, Ae. uniaristata, Ae. comosa, Ae. caudata, Ae. squarrosa, Ae. speltoides, Ae. bicornis, Ae. Aucheri, Ae. longissima* and *Ae. mutica*. He found that the awn of the palea of the terminal and lateral spikelets was dominant except in

the cross *Ae. comosa* x *Ae. mutica*; the awn of the glumes of the terminal spikelet was dominant (except in *Ae. comosa* x *Ae. mutica*), while in the glumes of the lateral spikelet it could be either dominant or recessive.

From the behaviour of the character awnedness (or absence of awns) in the interspecific crosses the author postulates the possibility of inhibitory gene action and he proceeds to point out that interspecific hybrids generally exhibit intermediate characters which depend for their manifestation not merely on the dominance of the main genes conditioning them but also on the influence of the main genes for other characters. This he terms a form of genic balance.

In wild species most genes are dominant and the interaction, intensifying or inhibitory, of the main ones may result in heterosis.

Since the glumes of *Ae. umbellulata* are many-awned, a character always dominant to the single-awn or awnless condition of other species, and since single-awn in turn is dominant to unawned, the author deduces that evolution proceeds as dominant characters are acquired and that in the wild species the heterozygotes must exhibit further evolved characters. Citing Eig on the most developed type of disarticulation of the ear [shattering] in some *Aegilops* species, the present author assigns the following order to the evolutionary sequence as shown in the shape of the spikelets: wedge-shaped → barrel shaped → *umbellulata* type; and he suggests that, judging from the interspecific hybrids, *Aegilops*, in the course of evolution, has acquired dominant characters of the awn and the mode of disarticulation of the ear.

In species crosses, the degree of combination between the chromosomes from the parent species and the fertility exhibited is a gauge of the closeness or remoteness of the relationship between the two species.

In a discussion of the importance of gene exchanges between species in the exploitation of wild grasses for improving cultivated plants, the following results are recorded:—

(1) In the hybrid from *Ae. caudata* (No. 2) x *Ae. cylindrica*, the association observed was $7_{II} + 7$ and on pollinating the hybrid with *Ae. caudata*, two plants with 7_{II} were obtained. One of these, BFl 1, produced 25% albinos in the next generation and had a very short awn, a recessive character. Gene transference from one species to another has been proved to have occurred in this instance.

(2) From the cross *Ae. caudata* (black eared) x *Triticum vulgare* (yellow eared) a large number of plants with 21_{II} (i.e. the same chromosome number as wheat) were obtained. The F_1 and subsequent generations were black eared, but after three back-crossings yellow-eared plants appeared; and on selfing, after two more back-crossings, black-eared fertile individuals were found, thus showing that the wheat chromosomes had acquired the *Ae. caudata* genes for black ear. These results, with some obtained from the cross *Ae. ovata* ($n = 14$) and *Ae. variabilis* ($n = 14$), are stated to indicate (1) that in hybrids fertility may be due to the acquisition of the complete chromosome set of one parent or to amphidiploidy and (2) that characters in such hybrids may breed true.

The writer suggests that, in view of the polyploidy within the two species, *Ae. triaristata* and *Ae. crassa*, both of which have varieties with $4x$ ($2n = 28$) and $6x$ ($2n = 42$) chromosomes, and the fact that there appear to be two sets of nearly homologous genomes in the $4x$ and $6x$ varieties and an additional set of genomes in the $6x$ forms, the $6x$ and $4x$ varieties should be distinguished as independent species.

OATS 633.13

845. Åkerman, Å. and Bader, M. 633.13:575.127.2:575.11.061.6 633.13:575.242
Uber Kreuzungen zwischen *Avena sativa* und *Avena fatua* und einige Untersuchungen über Fatuoiden. (**Hybrids between *A. sativa* and *A. fatua* and some investigations on fatuoids**).
Z. Zücht. A. 1937 : **22** : 1–44.

Two varieties of *A. sativa*, Engelbrecht (from Glocke II* x Great Moghul) and Svalöf Victory, have been crossed with *A. fatua*. The latter was obtained from central Sweden, two strains being used, one with grey glumes and the other with white. The F_1 of the interspecific crosses were intermediate in most respects between the two parents, although the *sativa* characters

* [Bell II]

tended to dominate. In the F_2 and F_3, a monohybrid segregation into *sativa*, intermediate and *fatua* types was observed. A tendency towards shedding was observed in some of the heterozygous families.

A trifactorial scheme is put forward to explain the inheritance of glume colour. Gene *S* determines black glumes and is epistatic to G_I and G_{II}, both of which control grey pigmentation; G_I is epistatic to G_{II}, the two grey phenotypes being slightly different. The triple recessive is white.

The *A. sativa* parents are assigned the following genetic constitutions: Engelbrecht, $Sg_I\ g_{II}$, and Svalöf Victory, $sg_I\ g_{II}$. Phenotypes with the following gene compositions were recognized; black, $Sg_I\ g_{II}$ and $Sg_I\ G_{II}$; grey I, $sG_I\ G_{II}$, $sG_I\ g_{II}$ and $sG_I\ G_{II}$; grey II, $sg_I\ G_{II}$; and white $sg_I\ g_{II}$. A close linkage between the gene pairs *S*, *s* and G_I, g_I is postulated and also the partial elimination of white gametes.

Double grained spikelets appeared in several families but this character was affected so much by the enviromnent that the influence of genetic factors was difficult to elucidate.

Fatuoid individuals arose as heterozygotes in a number of pure lines of *A. sativa*. They segregated into *sativa*, heterozygous and *fatua* types in a ratio of 1 : 2 : 1. The authors believe that hybridization can be excluded as a cause of their origin and they discuss alternative theories as to their nature.

846. Nishiyama, I. 633.13:576.356.5:581.148
(Cytogenetics and its application to plant breeding).
Bot. and Zool. 1938 : **6** : 196–205.

Work on the value of polyploids is reviewed and the way in which sterile interspecific hybrids exhibiting various degrees of homology in their genomes can be utilized is exemplified by reference to the results of wheat x rye crosses. The writer then records his prolonged attempts to transfer the non-shattering of the seed of *Avena strigosa* ($n = 7$) to the tetraploid *A. barbata* ($n = 14$). Though the chromosomes of the B genome generally remain as univalents when the above two species are crossed, some of them (b'3, a'4, a'6, a'7) occasionally form trivalents or tetrasomic chromosomes by conjugating with chromosomes of the A genome, thus demonstrating their partial homology. The author also identified a5 in the diploid and tetraploid as carrying the gene for non-shattering, while a'5 of the B' genome appeared to contain the gene for shattering. The discovery of one individual of an intermediate type ($n = 14$) led the author to assume that it should segregate into 3 classes shattering (a5a5a'5a'5), intermediate (a5a5a5a'5) and a true-breeding intermediate (a5a5a5a5). No segregation, however, occurred and it was suspected that the intermediate type dies at an embryonic stage and that a'5 and a5 are only partially homologous. The lethal genes, if situated in the non-homologous portion, could be eliminated through crossing-over and the ideal tetraploid a5a5a5a5 thus be obtained.

After some years of experimentation in 1936 among the offspring of intermediates a plant with perfect non-shattering ears was discovered and is recorded as having bred true up to the time of writing.

The importance of polyploids as a source of useful genes of economic value was confirmed by the author's discovery in his triploid oat hybrids of a gene advancing maturity by 2 weeks.

Brief mention is also made of the possible utilization of parthenogenesis in diploids, self-pollination with chromosome re-duplication in haploids, and Kihara and Katayama's work on the production of haploids in wheat by X-rays (cf. "Plant Breeding Abstracts", Vol. III, Abst. 201 and Vol. IV, Abst. 659).

847. Tervet, I. W. 633.13–2.451.2–1.521.6:578.08
The relation of seed quality to the development of smut in oats.
Phytopathology 1943 : **34** : 106–15.

The differences in attack by *Ustilago laevis* and *U. Avenae* that were observed with four varieties of oats in two succeeding years are not considered to be of significance since the intravarietal variations are of the same order as the intervarietal. This can partly be explained by the methods of inoculation that were used and partly by the differences in the provenance of the original seed samples. It is therefore suggested that in comparative experiments of this kind only one seed lot for each variety should be used.

848. WAGNER, S. 633.14:575.061.6:575.182:575.183
Die Übertragung nicht mendelnder Buntblättrigkeit durch den Pollen bei Roggen. (**The transference of non-Mendelian factors for variegation through rye pollen**).
Arch. Klaus-Stift. Vererb-Forsch. 1942 : **17** : 449–53.

Three forms of variegated rye, *aurevostriata*, *variabilis* and *aurescens*, were used as pollen parents in crosses with normal green varieties. The progenies obtained were back-crossed repeatedly to the variegated lines, the latter being always employed as the pollen parents. For the first three generations, only normal green offspring were formed but in the fourth, a mixture of green and variegated types were found in the *variabilis* back-cross and a similar mixture of forms was found in the fifth back-cross generations of the other two types. The segregation behaviour of the variegated phenotypes that appeared is described.

It is believed that these results cannot be attributed to the emergence of recessive mutations but should be interpreted as evidence of paternal transmission of non-Mendelian factors which achieve expression once a threshold value is attained. The two commonly discussed hypotheses of non-Mendelian inheritance, viz. cytoplasmic aberration and plastid mutation, are considered and it is concluded that the latter notion is more in accord with the facts quoted.

849. KOSTJUČENKO, I. 633.14:575.12(47)
(**Winter rye varieties for the east of the U.S.S.R.**)
Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture) Moscow 1942 : No. 1 : 47–50.

The failure to produce any really improved varieties of winter-hardy rye by orthodox breeding methods is ascribed to the fact that Lysenko's principle of selective fertilization has not been applied. Extensive collections of local forms of winter rye have now been made and the best of them are being subjected to free interpollination according to Lysenko's method. Thus when Bezenčuk yellow grained rye No. 1 was sown in propinquity to a local strain of winter rye its grain colour became green, the grain size increased and after a number of years it became perfectly winter-hardy and yielded 8·75 c. per ha. as compared with 6·88 c. from Benzenčuk rye and 7·23 c. from Omka.

The local rye Ključevskaja has proved the best winter rye for snowless regions, giving the highest yield of grain, which is very little inferior to Vjatka in size. It is a variety which has arisen by natural selection in the rigorous conditions of the steppes.

Another remarkable variety Uboganskaja 108, was selected from a self-sown plant found on waste land; this variety when grown without a snow cover yielded an average of 13·55 c. per ha. for 1940 and 1941, as against 8·60 c. for Omka and 12·50 for Dolinskaja.

Other successful rye varieties obtained by selection from local populations subjected to open pollination with a number of other varieties are described.

MAIZE 633.15

850. RHOADES, M. M. 633.15:575.061.633:575.182:575.243
Genic induction of an inherited cytoplasmic difference.
Proc. Nat. Acad. Sci. Wash. 1943 : **29** : 327–29.

The maize gene iojap (*ij*) determines variegated leaves when present as a homozygous recessive. When such plants are pollinated with *IjIj* pollen, the F_1 often contains white and variegated seedlings in addition to the green expected. This finding is interpreted as an instance of irreversible plastid mutation induced by the presence of the gene pair *ijij*. The induced mutation is permanent since, in some cases, the F_1 of the back-cross *Ijij*♀ x *IjIj*♂ consists only of white seedlings, even although half the progeny are heterozygous for *ij*.

851. VALLE, C. G. 633.15:575.12:575.148
Estudios genéticos sobre el maíz. 2. La prueba y utilización de las líneas homogéneas. (**Genetical studies on maize. 2. The testing and utilization of pure lines**).
Mem. Soc. Cubana Hist. Nat. 1942 : **16** : 29–36.

Various pure lines of maize were crossed with each other and with certain commercial varieties in all combinations in order to ascertain their breeding value. Crosses of pure lines with the variety Habana Pl-F indicated that the lower yielding lines sometimes gave hybrids with better yields than those obtained from the higher yielders; in general, however the lowest yielders, when crossed with Habana Pl-F gave uniformly poor yielding progeny.

The prepotency of certain of the lines when crossed with Habana Pl-F is noted, and it is found that not all the maize hybrids are as productive as the varieties from which they are derived. The author predicts the yield of the complex triple and quadruple hybrids from a knowledge of that of the pure lines and simple hybrids between them.

852. Bernstein, L. 633.15:575.125:581.192
Hybrid vigor in corn and the mobilization of endosperm reserves.
Amer. J. Bot. 1943 : **30** : 801–09.

Heterosis in maize hybrids is manifested in a relatively more rapid growth rate than the parent inbreds during the first 2 or 3 days after germination. This increase is associated with an earlier starch hydrolysis. It is suggested that this increase in hydrolytic activity may be effected in part by the higher water content of the hybrids.

Inbreds differ significantly in their quantities of α-amylase and β-amylase. The mode of inheritance of these characteristics is discussed, the evidence indicating that the amount of α-amylase is an embryo character while that of β-amylase is determined by the constitution of the endosperm.

853. Anderson, E. 633.15:576.16:576.312.34
A variety of maize from the Rio Loa.
Ann. Mo. Bot. Gdn. 1943 : **30** : 469–74.

An interesting maize variety has been collected from Chiuchiu, a village on the Rio Loa in northern Chile. It bears a close morphological resemblance to the maize of the prehistoric Nazca culture, and exhibits several features characteristic of certain oriental varieties. The chromosomes were knobless with the exception of a small knob on chromosome 6. This discovery re-opens the question of the oriental *v.* occidental origin of *Zea Mays*.

854. Mangelsdorf, P. C. 633.15:576.16:576.356:575.127.5
The origin of maize.
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 267–74.

Both maize and Florida teosinte (*Euchlaena*) possess 10 haploid chromosomes. They cross readily and the genetic behaviour of their progenies was investigated by using two dominant marker genes for each of the chromosomes in the maize parent employed. It was assumed that the chromatin segment between marker genes remained intact whenever the genes were inherited together, double crossing-over being too infrequent to affect the results significantly. The F_1 hybrids were then back-crossed to a maize variety in which all the marker genes were all present as homozygous recessives.

The behaviour of four of the chromosomes has now been fully analysed and it is found that the genes differentiating between maize and *Euchlaena* are not distributed at random.

Maize (Z) will also cross with *Tripsacum* (T), which has 18 haploid chromosomes, to give a highly sterile hybrid (ZT). Little pairing occurs at meiosis but up to 4 pairs may be found in loose association. Unreduced gametes are formed frequently and these function when the hybrid is back-crossed to maize, a 38-chromosome hybrid (ZZT) being produced. The maize genomes of this form pair regularly but the plants are completely pollen-sterile although on pollination with maize, a whole range of back-cross progeny are obtained. All of these have 20 maize chromosomes but the number of *Tripsacum* chromosomes ranges from 0 to more than 10. The number of chromosomes in the progenies cannot be explained by the hypothesis of random assortment and good evidence has been obtained of chromatin interchange.

It is concluded in the light of these cytological investigations that *Euchlaena* may well have arisen as the result of a *Zea* x *Tripsacum* cross, since *Euchlaena* bears no characters that are not found either in *Zea* or *Tripsacum*.

On back-crossing the *Zea* x *Euchlaena* hybrid to *Zea*, about one sixteenth of the progeny were found to be almost identical with the maize parent, a result explicable on the assumption of 4 major unit differences between the genera. Each of these 4 units can be resolved into a closely linked gene complex each of which exhibits effects similar to those observed when *Tripsacum* chromatin is transferred to the *Zea* gene complex. *Euchlaena* is regarded therefore as having the *Zea* chromosome configuration with 4 blocks of *Tripsacum* material superimposed or substituted. Blocks A, B and D have been located in chromosomes 4, 1 and 9 respectively; block C exhibits linkage with factors of chromosomes 4 and 10 and translocation is probably involved. A teosinte from Nobogame in Mexico differs from maize in respect of only 3 segments.

The author concludes that *Euchlaena* can be excluded as a possible ancestor of maize. Pod corn is regarded as a primitive form and it is pointed out that this type has protected seeds and a dispersal mechanism which enable it to maintain itself in the wild state. Only one centre of origin for cultivated maize is postulated and this is located in the Andes where the greatest diversity of types and the most highly specialized forms are found. The wild ancestor is not believed however to have been native there, the lowland plains of South American being regarded as the original habitat; the possibility that the wild prototype is still awaiting discovery in these regions is put forward.

Secondary contamination of maize by direct or indirect hybridization with *Tripsacum* is believed to have effected much of the varietal diversification of the species, particularly in North America. The pointed seeds of popcorns and the long, slender, straight-row flint and flour corns of North America are believed to carry *Tripsacum* factors. These conclusions are supported by investigations on chromosome knobs. Knobless maize forms are only found in the presumed primitive Andean varieties. Elsewhere, the knobbed condition, believed to have arisen from *Tripsacum* contamination, prevails, the number of knobs attaining a maximum in Central America and decreasing both to the north and to the south.

855. CAMERON, J. W. 633.15:576.312.32:576.354.46
Chromosomes of a maize relative, *Polytoca macrophylla* Benth.
Amer. J. Bot. 1943 : **30** : 776–78.

Two plants of *P. macrophylla* Benth. were examined cytologically. Both had 40 diploid chromosomes, the meiotic configurations being 20_{II} in one case and $18_{II} + 1_{IV}$ in the other. Pachytene chromosomes were knobless.

856. MUDRA, A. 633.15:581.162.32:581.02
Über die Reichweite des Pollenstaubes beim Mais in geschlossenem Verband. (**On the range of maize pollen in closed associations**).
Züchter 1943 : **15** : 29–31.

The author finds that cross-pollination in the middle rows of a maize lay-out is less than 1%, a value not significantly higher than that obtained by normal methods of spatial isolation. A short discussion follows on the relative importance of shelter, wind strength, plant height and position of varieties, in determining the degree of intervarietal crossing.

857. 633.15:581.46:575.42
KRICKL, M. 633.15–2.111–1.521.6
Zur Züchtung mehrkolbiger Maissorten und der Einfluss des Temperaturfaktors auf die Reife der Einzelpflanze. (**On the breeding of many-spiked maize varieties and the influence of the temperature factor on the maturation of individual plants**).
Züchter 1943 : **15** : 125–34.

Maize varieties from North America have been selected for the production of many-spiked individuals. The percentage of plants with two spikes is not correlated directly with the proportion of plants bearing two good spikes. Late maturing strains are the principal sources of the latter category. By repeated selection of two-spiked individuals, uniformly two-spiked families were obtained in the F_6; some of these bore three-spiked heads but further selection was unable to develop this feature.

By continuing selection for nine generations, the tendency to produce 1–3 side-shoots, each bearing 1–2 spikes was fixed. It is uncertain, however, whether such forms are of economic value. These varieties together with a sample of Bolivian provenance have been investigated also for their reaction to temperature factors. In all cases, early and late maturing genotypes were distinguishable and it was found that the early strains were less susceptible to low temperature damage than the late.

858. NEVENS, W. B. and
DUNGAN, G. H. 633.15.00.14(77.3)
Yields of corn hybrids harvested for silage: and methods to determine best time to harvest.
Bull. Ill. Agric. Exp. Sta. 1942 : No. 494 : 387–412.

The yields for silage of hybrid and open-pollinated maize are compared during the period 1935–1941. The performance of certain Illinois hybrids is compared also with that of commercial

hybrids. The open-pollinated variety Station Yellow Dent and the commercial hybrid Funk Hybrid G–94 were used in the periods 1935–39 and 1940–41 respectively as standards with which each year's results were compared.
In both quantity and quality of forage the hybrids are shown to be far superior to the open-pollinated corn, the Illinois and commercial hybrids proving equally satisfactory for silage purposes.
Although a few Illinois hybrids were considerably below average owing to poor adaptability and a certain tendency to lodging, most were very satisfactory. The best lines were Illinois Hybrids 206, 448 and 863.

BARLEY 633.16

859. Robertson, D. W.,
Immer, F. R.,
Wiebe, G. A. and
Stevens, H. 633.16:575.116.1
The location of two genes for mature plant characters in barley in linkage group No. 1.
J. Amer. Soc. Agron. 1944 : **36** : 66–72.
The linkage relations of the factor pairs *Ee*, for normal *v.* long outer glumes, and *Lk lk*, for awnless *v.* fully awned lemmae, were studied in relation to the following factor pairs in chromosome I: *Vv*, for non-six-row: six-row; *Ff*, for green: chlorina plant colour; *Or or*, for green: orange seedlings; and *Yy*, for green: virescent seedlings. The factor pairs *Lk lk* and *Vv* were completely linked and the gene order in chromosome I given as *(v, lk)–e–y–f–or.*

860. Suneson, C. A. and
Riddle, O. C. 633.16:575.125
Hybrid vigor in barley.
J. Amer. Soc. Agron. 1944 : **36** : 57–61.
A male sterile barley was used for the production of hybrid seed by a mass pollination technique, and the F_1 progeny were subsequently tested for yield and other manifestations of heterosis. The seven different pollen parents used showed differences in combining ability though, in every case, there was a large increase in yield in the F_1, averaging 20% over the whole trial. The authors suggest that the method would be useful for testing the yield transmitting qualities of varieties before using them for breeding purposes.

861. Krajevoj, S. J. 633.16:581.162.32
Selective fertilization in barley.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1942 : **36** : 105–07.
Hordeum sativum var. *pallidum*, when pollinated by a mixture of pollen from (*a*) itself, (*b*) var. *Dundar-beyi* Zhuk. (*c*) var. *erectum* Schübl., and (*d*) var. *medicum* Körn., gave 68·96% self-fertilized seeds, the other varieties effecting 4·60%, 14·94% and 11·50% fertilizations respectively. When the pollen mixture was used on var. *medicum*, self-fertilization accounted for 93·83% of the F_1, while the other three varieties were represented as follows: var. *erectum* 3·09%, var. *pallidum* 1·23% and var. *Dundar-beyi* 1·85%.

862. Riddle, O. C. and
Suneson, C. A. 633.16:581.162.32:578.08
Crossing studies with male-sterile barley.
J. Amer. Soc. Agron. 1944 : **36** : 62–65.
Fertilization was highest in the first 2–4 days following the first flower opening but occurred also after 6–8 days. The most effective method of crossing was by brushing a pollen bearing spike with clipped glumes against a male sterile spike at the receptive stage. Clipping the glumes of male sterile plants reduced the seed size. Maximum seed size was obtained when about 50% of the florets on a spike were fertilized.

863. Freisleben, R. 633.16:582:576.16(51.5)
Ein neuer Fund von *Hordeum agriocrithon* Åberg. (**A new discovery of *Hordeum agriocrithon* Åberg**).
Züchter 1943 : **15** : 25–29.
H. agriocrithon, previously reported by Åberg as a wild barley from Taofu, is cultivated in the

vicinity of Lhasa. This latter variety is described and compared with the wild form. It is a bearded barley with a brittle rachis and differs from the Taofu type in the absence of delayed seed germination.
Possible lines of evolutionary development in the barleys are discussed in the light of this discovery.

864. Briggs, F. N. and
Barry, G. L. 633.16–2.421.1–1.521.6:575.116.1
Inheritance of resistance to mildew, *Erysiphe graminis hordei*, in a cross of Goldfoil and Atlas barleys.
Z. Zücht. A. 1938 : **22** : 75–80.
The inheritance of field resistance to mildew has been studied in the progeny of the cross Goldfoil x Atlas. One major, incompletely dominant factor (*G*), derived from Goldfoil, was found to determine resistance and this was shown to differ from the resistance factor (*H*) of Hanna.
No linkage was found between *G* and the factors controlling either the number of rows in the spike or the type of hairs on the rachilla.

865. 633.16–2.451.2–1.521.6:575.42(51)
Yu, T. F. 632.451.2:576.16(51)
(Breeding hulled barley for resistance to covered smut [*Ustilago Hordei* (Pers.) K. and S.] in Kiangsu Province).
Nanking J. 1940 : **9** : 281–92.
[From Rev. Appl. Mycol. 1943 : **22** : 427–28].
Tests of the pathogenicity of 280 collections of covered smut on the barleys Hanna, Nanking 373 and Saitamachadaha revealed 5 different races, C–1, C–2, C–3, C–4 and C–5, the first two, composing 93·2% of all the collections, being closely related in virulence.
Fifty-four resistant lines have been found by testing over 9000 heads of Chinese barley selections. Selections from the progeny of Manchuria (C.I.957) x No. 4326 (a local selection) also produced resistant types. Among these hybrids, Nanking 555, 557, 562, 575, 580, 592 and 593 gave high yields and matured before Manchuria; of these Nanking 593 is the most promising.

MILLETS AND SORGHUM 633.17

866. Kida, T. 633.171:582(52)
(A classification of Italian millet in Formosa).
J. Taihoku Soc. Agric. For. 1941 : **5** : 150–63.
Out of 130 varieties of Italian millet in Formosa examined 42 were rejected as synonyms and 88 registered after classification according to earliness, size and form of ear and other morphological features of the flowers and grain.

867. Garber, E. D. 633.174:576.312:582
A cytological study of the genus *Sorghum*: subsections *Para-sorghum* and *Eu-sorghum*.
Amer. Nat. 1944 : **78** : 89–93.
Cytological evidence is adduced to support the division of the genus *Sorghum* into the two sections *Para-sorghum* and *Eu-sorghum*. The former section has 5 haploid chromosomes which stain uniformly with aceto-carmine at prophase; the nucleolus is attached to the nucleolar chromosome terminally, the region of attachment being marked by a spherical bulge. *Eu-sorghum* comprises species with 10 haploid chromosomes (20 in *S. halepense*); these stain selectively and the nucleolus is attached to its chromosome by an intercalary point, indistinguishable morphologically from the rest of the chromosome.
Multivalents were only observed in *S. halepense* which exhibited univalents, trivalents and quadrivalents at metaphase.

868. Heller, V. G. and
Seiglinger, J. B. 633.174:581.48:581.192(76.6)
Chemical composition of Oklahoma grain sorghums.
Bull. Okla. Agric. Exp. Sta. 1944 : No. B–274 : Pp. 5.
A chemical analysis of the grain of 28 sorghum varieties grown in Oklahoma is presented.

869. Parodi, L. R. 633.174:582(82)
Una nueva especie de "*Sorghum*" cultivada en la Argentina. (**A new *Sorghum* species cultivated in Argentina**).
Rev. Argent. Agron. B. Aires 1943 : **10** : 361–72.

Sorghum almum n. sp., a new species related to *S. halepense* (L.) Pers., is described. It is similar to the latter species in many characters including the chromosome number ($2n = 40$). Short descriptions of the other *Sorghum* species cultivated in Argentina, together with a key to their identification are also given.

RICE 633.18

870. Fuke, Y. 633.18:575:578.08
(**Time saving in plant breeding experiment with rice**).
Plant Breed. News 1934 : **9** : 152–53.

By growing F_1 seeds of rice hybrids in the greenhouse under artificial illumination at about 20–28° C., and at a later stage applying short day treatment for about 40 days, seeds ripened before April and could be used for field experiment on the F_2 generation.

871. Germek, E. 633.18:575:578.08
Processo eficiente para produção de mudas para progênies de arroz. (**An efficient method for producing seedlings of rice progenies**).
Bragantia, São Paulo 1942 : **2** : 515–20.

Each progeny is sown in a small galvanized iron cylinder with holes punctured in the sides. A number of cylinders are placed together on the seed bed, each with a separate progeny, and when the seedlings have reached a suitable stage of development they are transplanted into the field.

872. 633.18:576.356.5:575"793":581.02
Nagamatu, T. 633.18:581.162.5
(**Cyto-ecological studies on rice, *Oryza sativa* L**).
Jap. J. Genet. 1940 : **16** : 278–81.

Recognizing the value of polyploids in rice breeding, the author investigated their reaction to various environmental conditions.

Ecological studies showed that the haploid variety Dekiyama, the triploid Asahi No. 3 and the tetraploid T–2 were suitable for the Chugoku and Kyushu districts of Japan, while the early lowland rice, Norin No. 1 (the control), from Niigata prefecture, was suitable for North Japan, and Hanasazae (another control), cultivated in Formosa, was suited to southern Japan.

Short-day treatment was found to hasten heading by nearly one month in the ecologically intermediate types Dekiyama and Asaki.

Raising the temperature of the plot at night tended to delay heading in all varieties, though it appeared that the more genomes a variety contained the less sensitive was it to temperature.

Sterility was lowest in the untreated plot and greatly increased in plots kept under conditions of cold or heat at night. The polyploids also differed *inter se* in their reaction to such environments.

It is concluded that the responses to light and temperature which determine heading time are controlled more by the identity of the genes present than their number. Dekiyama, Asahi No. 3 and T–2 showed a similar trend in time of heading under short-day and night temperature treatments, but the very distinct northern and southern types, Norin No. 1 and Hanasazae, ecologically so different from the above three varieties, gave different reactions. Moreover, though the number of genomes apparently made no difference to the light reaction, in the case of temperature, the reaction was found to decrease as the number of genomes in the experimental variety increased.

873. Kondo, M. and
Yasahara, Y. 633.18:578.088(52)
(**Variety identification of rice kernels by means of alkali-test**).
Proc. Crop Sci. Soc. Japan 1941 : **12** : 325–32.

On being subjected to the action of a solution of caustic potash, 145 varieties of hulled rice exhibited differences in the disintegration of the kernels. The best results were obtained by treatment with a 2·38% solution of KOH at 20–25° C. for 24 hours. Polished rice is however best tested with a 1·7% solution of KOH at 25° C. for the same period and for broken kernels of hulled rice the optimum concentration is 1·8%.

"Blue rice" and "dead rice" proved more liable to disintegration than the normal type of rice and old rice disintegrated more readily than new.

Among the varieties not readily disintegrated were: Pedigree stock, Goeba and most foreign types. Varieties giving a medium reaction included Araki, Hinomoto, Kamenoo, Ozeki, Muto, and R. P. Allorio, while those easily disintegreated comprised Asahi, Omachi, Tango-Shinriki No. 1, Aikoku No. 2 and Kuni-no-Nishiki.

The causes of the differences recorded are considered and it is concluded that the test can be used to identify varieties from entire or broken kernels of hulled rice and to ascertain the quality of polished rice.

874. Kuang, H. H.,
Tu, D. S. and
Chang, Y. M. 633.18:581.46:575.113.4–184
Genetical studies on the polyhusks in cultivated rice (*Oryza sativa* L.).
Natural Sci. Soc. China 1943 : No. 5 : 15–16. (Mimeographed).

"Polyhusk" is an abnormal character of rice discovered first in Japan and again in Szechuan by the writers. In such abnormal plants, glumes additional to the normal ones are produced. It is a simple mendelian character. In the crosses, normal Mac-Tze-Tou x polyhusked Shui-Pei-Tao and normal Lu-Shih-Tze x polyhusked Lin-Shui-Tao, the F_1 is normal and the F_2 individuals segregate into 3 : 1 ratio. The gene specific to this character is denoted as f_1; in another cross, normal Tze-Ta-Hei x polyhusked Lin-Shui-Tao, however, the segregation in F_2 to a ratio of 63 : 1 indicates that this character is determined by triplicated genes which are denoted here as f_1, g_2, g_3. The polyhusked character has no linkage relation with the seven characters studied, namely, dwarfness, and color of auricle, margin, ligule, apiculus, midrib and leaf sheath.

Authors' Summary.

875. Nakamori, E. 633.18:581.481:575.242:575.11
(Double-grained rice).
Plant Breed. News 1934 : **9** : 759–60.

A mutant is described with 1–3 grains per spikelet and 3–5 pistils per flower; it sometimes produces malformed stigmas and ovaries and 6–12 stamens, which are often deformed and contain a large number of empty pollen grains. Fertility is about 55%. The mutant type breeds true and is transmitted as a Mendelian recessive to the normal type.

876. Akihama, K.,
Togawa, S. and
Nakagawa, M. 633.18–2.112–1.521.6:578.08
(A preliminary detection of drought resistance in varieties of upland rice through testing the cold resistance of seedlings).
Plant Breed. News 1934 : **9** : 1168–74.

Exposure of seedlings to cold, lack of water and a toxic solution of $KClO_3$ were the 3 methods successfully used to test for varietal differences in drought resistance.

OTHER CEREALS 633.19

877. Calvo, M. Q. and
Segura, M. F. 633.19:581.6:633.85(72.86)
Ensayo para la obtención de quenopodio en Costa Rica. **(Attempt to produce chenopodium in Costa Rica).**
Rev. Méd. (San José) 1942 : **5** : 185–87.
[From Biol. Abst. 1943 : **17** : Sect. D : Abst. 10182].

The only representative of the Chenopodiaceae in Costa Rica is *Chenopodium ambrosioides*. In hopes of replacing the imported *C. ambrosioides* var. *helminthicum* by the native form, the latter was analysed. It gave a low yield of oil of Chenopodium and contained only 45% ascaridol, the active principle.

878. Hunziker, A. T. 633.19:582(73 + 8)
Las especies alimenticias de *Amaranthus* y *Chenopodium* cultivadas por los Indios de América. **(The edible species of *Amaranthus* and *Chenopodium* cultivated by the American Indians).**
Rev. Argent. Agron. B. Aires 1943 : **10** : 297–354.

The author gives a critical taxonomic survey of the edible indigenous cultivated types of

Amaranthus and *Chenopodium* from North and South America. The following species are described, with a key to their identification: *C. pallidicaule* Aellen (Peru and Bolivia), *C. Quinoa* Willd. (Argentina, Bolivia, Chile, Ecuador and Peru), *C. Nuttalliae* Safford (Mexico), *A. edulis* Spegazz. (Argentina), *A. caudatus* L. (Argentina, Bolivia and Peru), *A. hybridus* L. var. *leucocarpus* S. Watson (Mexico and U.S.A.), *A. Powellii* S. Watson (*U.S.A.*) and *A. retroflexus* L. (U.S.A.). It is not known with certainty whether the last two species mentioned are cultivated types.
The following new forms and varieties are created by the author: *C. pallidicaule* Aellen, f. *melanospermum* nov. form., *C. Quinoa* Willd., var. *lutescens*, nov. var., *C. Quinoa* Willd., var. *melanospermum*, nov. var., *A. edulis* Spegazz., var. *spadiceus*, nov. var., *A. hybridus* L. var. *leucocarpus* S. Watson nov. comb.

FORAGE GRASSES 633.2

879. Hardison, J. R. 633.2–2.421.1:576.16:631.521.6
Specialization of pathogenicity in *Erysiphe graminis* on wild and cultivated grasses.
Phytopathology 1944 : **34** : 1–20.
Inoculation experiments with 8 cultures of *E. graminis* on to various species and varieties of wild grasses showed that no culture was restricted to only one host species and that some could even infect grasses belonging to different genera.
A virulent culture from *Agropyron repens* was found to be capable of infecting the previously resistant barley variety Arlington C.I.702 and is considered to be a new race.
Different reactions to any one strain of *E. graminis* were found between individual grass plants, and the author therefore concludes that some selection for resistance could be carried out.

880. Wernham, C. C. and Chilton, St. J. P. 633.2–2.472.3–1.521.6
***Typhula* snowmold of pasture grasses.**
Phytopathology 1943 : **33** : 1157–65.
The authors discuss the reactions of various grasses to the snow mould, *Typhula*, giving an account of the method of testing under controlled conditions. No conclusions are reached as to the presence or absence of species resistant to *Typhula* in the series of experiments under discussion.

881. Myers, W. M. 633.24:576.356.5:575.11
Cytological and genetic analysis of chromosomal association and behavior during meiosis in hexaploid timothy (*Phleum pratense*).
J. Agric. Res. 1944 : **68** : 21–33.
In plants of hexaploid *P. pratense* L. the chromosomes at diakinesis are associated as bivalents, quadrivalents and sexivalents. Among seven plants, the average number of quadrivalents per sporocyte ranged from 2·9 to 4·9 and the average number of sexivalents from 0 to 0·9. In any sporocyte the maximum number of quadrivalents observed was 7 and of sexivalents 3. Chiasma frequency was not associated with multivalent frequency.
The author suggests that the high frequency of quadrivalents observed provides cytological evidence against the hypothesis of allohexaploidy and while genetic results are inconclusive, they are so far in agreement with the above interpretation. Four genomes of one kind and two of another are suggested instead of six homologous genomes, the occasional sexivalents being explained on the basis of incomplete differentiation of chromosomes of the two genomes from those of the four. On inbreeding, dihybrid and trihybrid ratios were not obtained, indicating that the chromosomes did not pair regularly as particular bivalents.
The necessity for a knowledge of the type of chromosomal association during meiosis in the planning of a breeding programme is indicated.

882. Stebbins, G. L. and Tobgy, H. A. 633.262:575.127.2:581.162.5:576.12
The cytogenetics of hybrids in *Bromus*. I. Hybrids within the section *Ceratochloa*.
Amer. J. Bot. 1944 : **31** : 1–11.
F_1 hybrids have been obtained by inter-crossing different octoploid strains of the *B. carinatus* complex and from the cross *B. carinatus* x *B. catharticus* (hexaploid). All the *B. carinatus*

strains exhibit a regular meiosis, 28 bivalents being formed; 21 of these are medium sized (the ABC genomes) and 7 are large (the L genome). A certain amount of meiotic irregularity occurs in the inter-strain hybrids, univalents and bridge formation having been observed. Some of these hybrids are relatively fertile but several are highly sterile. Although chromosomal aberrations are not pronounced, it is considered probable that the hybrid sterility is principally chromosomal. Hybrids of *B. carinatus* x *B. catharticus* are completely sterile and form 21 medium-sized bivalents and 7 large univalents at meiosis. Bridge formation occurs but not more frequently than in the inter-strain hybrids of *B. carinatus*. Occasional loose pairing of the L chromosomes has been observed.

These facts are held to suggest that *B. catharticus* is an allo-hexaploid with the genome complement AABBCC while *B. carinatus* is an allo-octoploid, AABBCCLL. The L genome may be derived from hybridization with members of the section *Bromopsis* which possess 14 large chromosomes; more than one diploid species would probably be involved and this would go some way in explaining the extreme polymorphism of the *B. carinatus* complex.

883. Myers, W. M. 633.263:576.356.5:576.354.4
The randomness of chromosome distribution at anaphase I in autotriploid *Lolium perenne* L.
Bull. Torrey Bot. Cl. 1944 : **71** : 144–51.

The behaviour of chromosomes has been investigated at meiosis of two autotriploid plants of *L. perenne*. In general, the distribution of chromosomes in the anaphase I sporocytes was in accordance with the assumption that the metaphase I univalents are distributed at random and that the extra chromosome of the trivalents also assorts at random.

884. Webster, C. B. 633.287(73)
Side-oats Grama—O.K.
Seed World 1943 : **54** : No. 8 : p. 20.

The use of the grass known as side-oats grama (*Bouteloua curtipendula*) is recommended. This is a species indigenous to the western regions of the United States that has been overlooked in the past. Improved strains are being selected.

LEGUMINOUS FORAGE PLANTS 633.3

885. 633.31:575.061.6
Schröck, O. 633.31:575.113.7
Genetische Beobachtungen an Luzerne (*Medicago media*). [**Genetical observations on lucerne (*M. media*)**].
Z. Pflanzenz. 1943 : **25** : 81–91.

The genetical behaviour of a series of characters in lucerne has been investigated by inbreeding. Segregation ratios were observed as follows: petal coloration (deep yellow : pale yellow : white), 1 : 2 : 1; anthocyanin pigmentation in the veins of the standard petal (present : absent), 3 : 1, the pigmentation pattern on the inner region of the keel (dark violet : pale violet : absent), 1 : 2 : 1; flower size (large : small), 3 : 1; pigmentation of the calyx teeth (pigmented : unpigmented), 3 : 1; leaf habit (folded along midrib : flat), 3 : 1; and leaf colour (dark green : light green), 3 : 1.

The progeny of a mutant causing stunting segregated into normal and abnormal plants in a ratio of 1 : 2, and it is suggested that this is an instance of a lethal gene, inviable in the homozygous condition and determining a stunted habit when heterozygous.

There is a short discussion on the anatomical factors affecting leaf colour and also on the relation between colour and protein content, fresh weight and dry weight. It is believed that a complex of genes controls these last named qualitative characters.

886. 633.31:581.162.3:575.11:575.127.2
Schröck, O. 633.31:581.04:575.129
Beobachtungen an einem Bastard zwischen Luzerne (*Medicago media*) und Gelbklee (*Medicago lupulina*) und seiner Nachkommenschaft. [**Observations on a hybrid between lucerne (*M. media*) and black medick (*M. lupulina*) and on its progeny**].
Züchter 1943 : **15** : 4–10.

M. media could only be hybridized with *M. lupulina* when the former was used as the female parent. The F_1 was intermediate between the parents and set no seed unless artificially pollinated. Pollen was formed in abundance but was mostly shrivelled.

An amphidiploid was obtained by means of colchicine but this proved to have weaker vegetative growth than the diploid; it was not autogamous and in spite of producing a high percentage of viable pollen grains, was less fertile than the diploid after artificial selfing. The amphidiploid pollen grains were larger on the average than those of the diploid but had a narrower range of size variation.
In the F_2 generation of the untreated hybrid, continuous variation in the morphological characters of the progeny was observed. Only six autogamous plants were detected, and of these only one (a type resembling *M. lupulina*) produced a good seed set. When the non-autogamous segregates were pollinated by insects, considerable differences in fertility became apparent.
The parents of the cross were not examined cytologically but it is presumed that the *M. media* had 32 chromosomes and the *M. lupulina* 16. The F_1 hybrids had 24 chromosomes in most cases and the F_2 usually 24 or 32.
The author concludes that the two species differ essentially only in their genetic constitution, not in virtue of their chromosome arrangements.

887. Ragonese, A. E. and
Marcó, P. R. 633.31–2.6–1.521.6:575.11
Resistencia al nemátode del tallo de diversas líneas y procedencias de alfalfas.
(**Resistance to stem nematode of various lines and provenances of lucerne**).
Rev. Argent. Agron. B. Aires 1943 : **10** : 378–84.

Strains of lucerne were tested for resistance to the stem nematode *Anguillulina dipsaci* (Kuhn) Gerv. et V. Bened. It was found that among the Argentine lines only a very small percentage of resistant individuals were present, whilst those from U.S.A., France and other countries showed a much higher percentage of resistant forms (up to 68% in one line). Resistant plants, even when self-pollinated, did not give more than 83% resistant progeny, with an average of 77%, and could not therefore have been homozygous for resistance.

888. Bobrov, E. G. 633.321:576.16
(**The origin of cultivated red clover**).
Sovetskaja Botanika (Soviet Botany) 1940 : No. 1 : 27–39.

Cultivated red clover (*Trifolium sativum* Crome), with its three sub-species: *praecox*, *serotinum*, and "Mattenklee", as well as the cultivated form of *T. expansum*, are respectively derived from the wild *T. pratense* L., and its three sub-types: *atlanticum*, *continentale*, and *subalpinum*, and *T. expansum* W. and K. The author discusses also three other wild species of red clover: *T. fontanum*, *T. borysthenicum* Gruner, and *T. seravschanicum* Ovcz. from which no cultivated varieties have yet been obtained. He emphasizes the importance of carefully studying the many races of wild red clover with a view to breeding still more varieties of the cultivated red clover than are yet known. He refers to one such possibility in a race of wild red clover, growing in the region of the river Jenisei [Enisei], which according to one account may survive six to seven years, and according to another, twelve. I. Z.

889. Musser, H. B. and
Thornton, J. K. 633.321–1.524(74.8)
Local, domestic and foreign red clover seed.
Bull. Pa Agric. Exp. Sta. 1943 : No. 458 : Pp. 16.

Comparative trials of red clover varieties are reported. Several local strains have exhibited more disease resistance and better adaptability to Pennsylvania conditions than other types.

890. Becker, R. and
Wehrmacht, Z. 633.322:581.149:581.4:582
Untersuchungen über die Lebensdauer verschiedener Weisskleeformen.
(**Investigations on the longevity of different forms of white clover**).
Pflanzenbau 1943 : **20** : 27–40.

Varietal differences have been observed between white clover types drawn from Germany, Denmark, Italy and England, in respect of the following characters: longevity, flower production, branching habit and degree of rooting. The longer life cycles were found in wild strains and positive correlations between this feature and reduced frequency of flowering, degree of branching and extent of adventitious rooting were established.
The authors propose a classification of white clover varieties based on the criteria investigated.

891. GRIZZARD, A. L. and HUTCHESON, T. B. 633.364:581.02(75.5) 633.364:631.8(75.5)
Experiments with *Lespedeza*.
Bull. Va Agric. Exp. Sta. 1940 : No. 328 : Pp. 20.
Varietal adaptability of *Lespedeza* to the soil and climatic conditions of Virginia is described, also the response of varieties to fertilizers.

892. TROLL, H.-J. 633.367:575.242.061.63
Anthocyanmutanten bei *Lupinus angustifolius* L. (**Anthocyanin mutants in *L. angustifolius* L.**)
Züchter 1943 : **15** : 73–78.
Two mutants of *L. angustifolius* are reported in which the leaves and seeds exhibit increased anthocyanin pigmentation. One of these forms arose from an alkaloid free line and the other from a bitter variety. The two mutants, when crossed together, gave a uniformly pigmented F_1 while in the F_2, all the 2725 offspring were pigmented with the exception of 18 plants. When crossed with unpigmented types, a 3 : 1 segregation of normal to pigmented forms occurred in the F_2.
It is concluded that the two mutants are both controlled by the same single recessive gene which is named *purpureus*. The occurrence of the 18 unpigmented individuals in the progeny of the cross between the two pigmented mutants is ascribed to back-mutation.
Pigmentation does not appear to be associated with alkaloid content nor with certain physiological characteristics. Evidence was obtained however to indicate that the mutants were less disease resistant and produced a lower seed yield than the parents.

893. KLAWITTER, G. and SENGBUSCH, R. v. 633.367:581.6:575.11
Die Züchtung von vollkommen alkaloidfreien Süsslupinen, die sich zur Herstellung von menschlichen Nahrungsmitteln eignen. (**The breeding of perfectly alkaloid-free sweet lupins which are suitable for the production of human food-stuffs**).
Züchter 1943 : **15** : 10–12.
Three methods for breeding completely alkaloid-free sweet lupins are outlined, together with a technique for the discrimination of such types from those only moderately free. The first method is the searching for new sweet strains within the land races. Secondly, the finding and selection of new mutants is recommended; such mutations may be either allelomorphs of the genes *dulcis* or *amoenus* or they may occur at other loci. Two new gene pairs have already been detected. Thirdly, hybridization of lines carrying the various recessive genes determining sweetness is suggested and also the crossing of the resultant double, triple or quadruple recessives with other types carrying desirable qualities.

894. WUTTKE, H. 633.367–2.484–1.521.6:575.115
Gegen *Fusarium oxysporum* resistente Stämme der gelben Lupine. (**Strains of yellow lupin resistant to *Fusarium oxysporum***).
Züchter 1943 : **15** : 31–33.
Yellow lupins have been selected for resistance to *F. oxysporum*. The hereditary nature of resistance has been demonstrated and it is thought probable that it behaves as a recessive character in hybridization.

ROOTS AND TUBERS 633.4

895. OLSSON, P. A. 633.4.00.14(48.5)
Svensk rotfruktsodling. En sammanställning av resultat från Sveriges Utsädesförenings försök till ledning vid val av rotfruktsslag och -sort. (**Swedish root crop cultivation—A survey of results from the Swedish Seed Association's experiments as a guide in the choice of the kind and variety of root crop**).
Sverig. Utsädesfören. Tidskr. 1942 : **52** : 45–104.
The need for increased fodder production in Sweden is stressed and the various root crops and their different growth requirements are mentioned.
Data from various long series of root crop variety trials at Svalöf and at different centres are discussed in detail.
The vitamin C content was estimated for several of the root crops studied.

896. NAGAHARU, U. 633.42:575.127.2:581.162.5
(An artificial synthesis of *B. Napus*).
Plant Breed. News 1934 : **9** : 965–66.
The F_1 plant from *Brassica campestris* x *B. oleracea* proved identical with *B. Napus* and had $2n = 38$. Gametogenesis of the hybrid was normal and fertility complete. The F_2 bred true and resembled ordinary strains of *B. Napus* L. in every respect.

897. TERAO, H. 633.42:575.127.2"793"
(An inter-specific hybrid of *Brassica* as a new material for the improvement of oleiferous rape).
Plant Breed. News 1934 : **9** : 161–62.
A cross was made between a French variety of *B. Napus* and the Indian Notani variety of *B. campestris* which is very early in maturing. The F_1 flowered later than the latter variety, but it was hoped that new extremely early types might segregate out later on.

898. RANNINGER, R. 633.426:581.6:575.42
Die Züchtung der Krautrübe für Futterzwecke und als Ölfrucht. **(Breeding swedes for fodder purposes and for oil-seed).**
Züchter 1943 : **15** : 39–43.
The author describes methods whereby swedes may be propagated vegetatively, and then proceeds to describe two swede types which were first differentiated from comparison between cuttings. The W-type includes forms with a well developed root while the S-type comprises forms producing a considerable quantity of oil-seeds. The latter are compared to rape and their development by means of selection for oil content is urged.

899. TAMARGO, M. A. 633.491:575(72.91)
Investigation program for the production of seed potato in tropical countries.
Proc. 16th Annu. Conf. Asoc. Tecn. Azucareros, Cuba 1942 : 83–87.
The author discusses the value of South American potato species for the breeding of a variety adapted to the short days and high temperatures of the growing season in Cuba.

900. STELZNER, G. 633.491:576.356.5:581.04:575.127.2:632.7
Wege zur züchterischen Nutzung des *Solanum chacoense* Bitt. in Hinblick auf die Züchtung käferresistenter Kartoffelsorten. **(Methods of using *S. chacoense* Bitt. in breeding, with special reference to the breeding of Colorado beetle resistant potato varieties).**
Züchter 1943 : **15** : 33–38.
The morphology of *S. chacoense* is described and it is pointed out that all varieties are resistant to Colorado beetle but only some to wart disease.
S. chacoense has 24 chromosomes in contrast to the 48 of *S. tuberosum*. Crosses between these two species are usually successful when *S. chacoense* is the female parent. The triploid F_1 hybrids ($2n = 36$) are highly sterile and of little use in breeding, but occasional tetraploid hybrids ($2n = 48$), arising presumably from the fertilization of a diploid egg, are also produced; these are highly fertile and valuable for breeding purposes. The reciprocal cross is difficult to accomplish, a finding which does not accord with the generalization that diploid tetraploid crosses are most easily made with the tetraploid as the female parent. Tetraploid hybrids have been obtained also in this cross in addition to the triploids and it is supposed that diploid pollen grains, which are known to occur in *S. chacoense*, have functioned in these cases.
The cross *S. demissum* ($2n = 72$) x *S. chacoense* ($2n = 24$) produces fertile tetraploid ($2n = 48$) offspring which combine resistance to *Phytophthora* and beetles; they can be crossed without difficulty to *S. tuberosum*.
Tetraploid plants of *S. chacoense* may be obtained by means of the colchicine technique. These plants, however, vary considerably in fertility and although some are fertile and will cross with *S. tuberosum*, others are highly sterile.

901. KAWAKAMI, K. 633.491:581.331.2:581.162.4
(On the preservation of potato pollen).
Plant Breed. News 1934 : **9** : 2012–16.
Tests of the viability of potato pollen after storage showed that the most satisfactory results were obtained with 15–30% humidity, under which conditions the pollen remained viable for 14 days or more and gave a high set of berries.

902. KÖHLER, E. and BODE, O. 633.491:581.6:575.11:575.127.2
Untersuchungen über die Variabilität der Stärkekornform in der Gattung *Solanum*, sectio *Tuberarium*. (**Investigations on the variability of the starch grain form in the genus *Solanum*, section *Tuberarium***).
Züchter 1943 : **15** : 135–43.

Significant differences are reported in the length/breadth ratio of starch grains in varieties of *S. tuberosum* and *S. demissum*. Both the mean value of the ratio and its range of variability are of diagnostic importance. The ratio is little affected by the absolute size of the grains, by the environment or by the presence of viruses. Genetical studies of this value were made in a cross of *S. tuberosum* and *S. demissum*; a continuous range of values was realized in the F_1 and the possibilities of matroclinous inheritance excluded.

903. VARGAS, C., C. 633.491:582(85)
Nuevas especies de papas silvestres del Perú. (**New species of wild potatoes from Peru**).
Rev. Argent. Agron. 1943 : **10** : 396–98.

Three new tuberiferous *Solanum* species (section *Tuberarium*) and one new variety are described, viz. *S. Buesii*, *S. Santolallae*, *S. Santolallae* var. *acutifolium* and *S. lignicaule*.

904. 633.491–2.111–1.521.6
STELZNER, G. 633.491:581.162.5:575.127.2
Über die Fertilitätsverhältnisse bei Bastardierungen zwischen der frostfesten Wildkartoffel *Solanum acaule* Bitt. und der Kulturkartoffel *Solanum tuberosum* L. (**On the degree of fertility in crosses of the frost resistant wild potato *S. acaule* Bitt. and the cultivated potato *S. tuberosum* L.**).
Züchter 1943 : **15** : 143–44.

Strains of *S. acaule* differ *inter se* in their degree of winter-hardiness, dwarf forms being most hardy. Differences are also found in the degree of fertility shown by the progenies of crosses with *S. tuberosum*. Some strains give highly sterile progenies in which parthenocarpic berry formation is frequent. The most fertile hybrids are obtained by crossing *S. tuberosum* with plants derived from intervarietal crosses of *S. acaule*.

905. LECLERG, E. L. 633.491–2.19:575.1
Non-virus leafroll of Irish potatoes.
Amer. Potato J. 1944 : **21** : 5–13.

A non-virus leaf-roll is described which is probably a heritable character although the expression of the defect is conditioned by environmental factors. Varietal differences in the frequency of the disease are reported.

906. MUJICA, R. F. 633.491–2.412.5–1.521.6(83)
Susceptibilidad de variedades de papas a la sarna polvorienta causada por la *Spongospora subterranea* (Wallr.) John. [**Susceptibility of potato varieties to powdery scab caused by *Spongospora subterranea* (Wallr.) John**].
Bol. Sanid. Veg., Santiago 1942 : **2** : No. 1 : 17–19.

Forty-nine Chilean and foreign potato varieties were tested in the field for their susceptibility to powdery scab. Certain promising varieties are being subjected to more detailed tests.

907. 633.491–2.7–1.521.6
Sequoia potato shows leafhopper resistance.
Sth. Seedsman 1944 : **7** : No. 2 : p. 49.

Marked resistance to leaf-hopper attack of the Sequoia variety, in contrast with Green Mountain, Mohawk and Sebago, is reported. Vines of Sequoia were also still green after the first frosts, and the longer growing season gave a much higher yield than other varieties.

908. TORKA, M. 633.491–2.7–1.521.6
Die Widerstandsfähigkeit eines *Solanum chacoense*-Klons gegenüber dem Kartoffelkäfer (*Leptinotarsa decemlineata* Say). [**The resistance of a *S. chacoense* clone to the Colorado beetle (*L. decemlineata* Say)**].
Züchter 1943 : **15** : 145—48.

Strains of *S. chacoense* differ in the degree of their resistance to the Colorado beetle. F13, a clone from Ahun, exhibits a high degree of resistance, both to the larvae and to the adults. Since it is

difficult to cross either *S. polyadenium* or *S. Jamesii* with *S. tuberosum*, the use of this *S. chacoense* clone is recommended. The possible proximate causes of beetle resistance are enumerated.

909. Larson, R. H. 633.491–2.8:576.16:631.521.6
A foliar mottle and necrosis in Chippewa potatoes associated with infection by a strain of the potato X virus.
Phytopathology 1943 : **33** : 1216–17.

A new strain of potato virus X has been discovered on Chippewa potatoes grown in Wisconsin. Sebago, Triumph, Red Warba, Russet Burbank varieties, and plants derived from selfed Katahdin seed are all susceptible; seedling 41956 is immune. The detailed symptoms of this disease both in potatoes and in test plants are described.

910. Terao, H. 633.492:581.162.5
(Cross-sterility groups in varieties of sweet potato).
Plant Breed. News 1934 : **9** : 1163–67.

Records of cross-pollination experiments during seven years at Okinawa-ken Agricultural Experiment Station suggest that there are three groups each intra-class sterile and inter-class fertile in East's sense. Sterile pollen was found in some varieties; B16 (Kawagoe) in particular showed over 50% empty pollen grains and a very low set where it was used as the pollen parent.

FIBRES 633.5

911. 633.51(62)
(The areas that have been planted with different types of cotton for the year 1943).
Egypt. Agric. Rev. 1943 : **21** : 221–27.

Details are given of the areas sown under different cotton varieties in Egypt in 1943.

912. 633.51:575.127.2:581.162.5
Nakatomi, S. 633.51:576.312.35
(The fertility of an inter-specific hybrid of cotton).
Plant Breed. News 1934 : **9** : 548–49.

An F_1 plant from the Egyptian Ashmouni ($n = 26$) x a Manchurian variety (*G. herbaceum*, $n = 13$) bore no seed when selfed, but on being pollinated by Kings Improved (*G. hirsutum*, $n = 26$) gave a few seeds. A plant raised from among these flowered abundantly and was partly fertile, selfed or crossed. It had $n = 26$ chromosomes.

913. Nakatomi, S. 633.51:575.42"793"(52)
(A new variety of upland cotton adaptable to the southern Manchuria, Kannô No. 1).
Plant Breed. News 1934 : **9** : 544–47.

By line selection of an early maturing upland cotton, King's Improved, at Kantô-syu Agricultural Experiment Station, the new line, Upland Cotton Kannô No. 1, was obtained. It matures much earlier and is more productive than the parent type. It was thought most promising for southern Manchuria.

914. Mendes, A. J. T. 633.51:576.356.5:581.04
Algodões poliplóides obtidos pela colchicina. Observações citológicas em *Gossypium hirsutum*, octoplóide. **(Polyploid cottons obtained by colchicine. Cytological observations on octoploid *G. hirsutum*).**
Bragantia, São Paulo 1942 **2** : 101–10.

Immersion of delinted seeds in a 0·15% solution for 16 hours was found to be the most effective treatment. Some plants of *G. hirsutum* failed to react at all, whereas in *G. herbaceum* all plants reacted equally. Most of the roots of the abnormal looking plants of *G. hirsutum* proved to contain a mixture of tissues with $2n = 52$ and $2n = 104$; flowers with mixed tetraploid and octoploid tissue were also encountered.

At anaphase I in the octoploids 52 chromosomes generally went to each pole but various deviations were also occasionally observed. Secondary association was of frequent occurrence. Pollen formation was more or less normal but the anthers mostly failed to dehisce. The pollen was larger and more variable in size than in normal plants. No seed was obtained either from self-pollination or from cross-pollination with either octoploid or tetraploid. Occasional fruits were formed from open pollination; the seeds obtained, which were usually abnormally large, could often be induced to germinate only by incision of the testa. The plants produced frequently had $2n = 52$ chromosomes.

915. NAKATOMI, S. 633.51:581.6:575–181.12
(The improvement of the native cotton of Manchuria).
Plant Breed. News 1934 : **9** : 547–48.
Three selected strains obtained from a cross between a Manchurian cotton and a variety from southern China are illustrated. They mature early like the native cotton which they surpass in ginning percentage and staple length.

916. KEARNEY, T. H. 635.51:582:576.16:575
Cotton breeding in relation to taxonomy.
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 251–55.
The difficulties attending the search for the wild prototypes of cultivated cottons are considerable, firstly, because cotton was grown and widely distributed in prehistoric times, and secondly, because many types are intercompatible and hybridize with ease. It is possible that the original ancestors no longer exist and there is reason for believing that many and perhaps all of the wild linted species are escapes from types formerly cultivated.
Systematic study of the group is not easy especially as hybridization gives rise to many distinctive phenotypes. It is suggested that only a fifth of the 160 species listed in *Index kewensis* are worthy of specific status. The difficulties in determining specific distinctions do not apply however to the wild lintless species, for these are usually well-defined.
The lintless types are most frequently found in rugged habitats; they have 26 chromosomes and are only distantly related to each other. Crossing is difficult to accomplish.
Sterile hybrids usually result from hybridization between wild and cultivated species but fertile crosses can be easily obtained from interspecific crosses within the American or Asiatic groups. No valuable types have so far resulted from interspecific hybridization in contrast to the successes resulting from intraspecific crossing. The origin of S x P cotton is traced in order to illustrate the value of the last named method.

917. YOUNG, P. A. 633.51–2.484–1.521.6:632.6
Cottons resistant to wilt and root knot and the effect of potash fertilizer in east Texas.
Bull. Tex. Agric. Exp. Sta. 1943 : No. 627 : Pp. 26.
The following cotton varieties were found to show high resistance to *Fusarium* wilt: Coker 4-in-1, Coker 100 Wilt Resistant Str. 39–5, Delta Dixie W.R. Str. 2, Tifton Dixie Triumph, Dixie Triumph 25–12, Dixie 14–5 Str. 2, Delfos 425, Miller 610, Deltapine 12, and Stonewilt. Varieties resistant both to *Fusarium* wilt and nematode root knot were: Coker 4-in-1, Coker 100 W.R. Str. 39 5, and three strains of Dixie varieties. Miller 610 lost much of its wilt resistance in the presence of root knot.
Resistance to both diseases was shown to be considerably lower when the plants were suffering from potash deficiency.

918. KUHK, R. 633.52:576.356.5:581.4:581.162.5
Vergleichende Untersuchungen an di- und tetraploidem Lein (*Linum usitatissimum* L.). [**Comparative investigations on diploid and tetraploid flax (*L. usitatissimum* L.).**
Z. Pflanzenz. 1943 : **25** : 92–111.
Eight diploid varieties of flax were treated with colchicine in order to obtain tetraploid derivatives and these were compared with the parent types. The tetraploids had thicker but less rigid stems than the diploids; they were more sparingly branched and bore thicker and wider leaves. Flower and capsules were larger but this size increase was accompanied by reduced fertility. Significant differences in this last respect were found between different tetraploid families, while an increase in fertility was obtained from crossing oil and fibre types.
Individual cells of the tetraploids were larger than those of the diploids and lignification occurred later. The xylem was less compact while the fibre bundles were less numerous, contained fewer cells and were more loosely arranged. Growth rate was slower and fewer leaves were produced; the fresh weight, absolute dry weight and water content were higher and the osmotic pressure lower.

919. FLOR, H. H. 633.52–2.482–1.521.6:575.42
Pasmo disease of flax.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1943 : **6** : No. 1 : 31–33.
The following flax varieties are said to be only moderately susceptible to pasmo disease (*Septoria*

linicola): Bison, Biwing, Redwing, Koto and Buda. Selection with these types is proceeding with a view to producing varieties possessing pasmo resistance coupled with other disease resistant qualities.

920. 633.522:575"793":578.088
RUDAKOVA, M. M. 633.522:577.8:578.088
(Diagnosis and prediction of earliness and sex in hemp on the basis of the theory of age cycles).
Pap. St. Inst. Agric. Gorkii, U.S.S.R. **1943** : **4** : 93–121.

Four hemp varieties differing in time of ripening were subjected to periodical examination during the entire growing period when grown under as nearly as possible identical conditions. The early variety was characterized by a greater length of the first internode at any given age, an earlier formation of the internode of maximum length, an earlier differentiation of the two sexes (at the 7th–11th nodes as opposed to the 12th–18th in late Italian varieties), shorter petioles, especially of the first 3-4 leaves, lower chlorophyll content of the seedlings and earlier withering of the first leaves; the seeds absorbed water more rapidly when soaked, the soaked seeds had a greater lipase activity and a greater content of monose; their invertase activity was less than that of the late varieties. The rate of germination was also greatest in the early varieties. In varieties where there was a pronounced difference between the time of maturity of the male and female plants, the males could be distinguished in the early growth stages by the possession of many of the above characters associated with early varieties, while the females show a greater resemblance to late varieties. Anthocyanin pigmentation of 5–6 day old seedlings was correlated with female sex at maturity in over 70% of cases.

921. PILAR RODRIGO, A. del. 633.524.3:582(82)
Especies de "*Sida*" espontáneas en la Argentina que pueden utilizarse como textiles. **(Wild species of *Sida* in Argentina that can be used for textiles).**
Rev. Argent. Agron. B. Aires **1943** : **10** : 373–77.

Certain species of *Sida* are said to be equal to flax in the quality and strength of their fibres. Three Argentine species: *S. acuta* var. *carpinifolia* (fibre length 10.10 mm.), *S. cordifolia* (fibre length 8·20 mm.) and *S. rhombifolia* (fibre length 6.40 mm.) have been investigated and described.

922. 633.526.2:582
RESENDE, F. 633.526.2:575.127.2
Suculentas Africanas III. Contribuïção para o estudo da morfologia, da fisiologia da floração e da geno-sistemática das Aloinae). **(African succulent plants. III. Contribution to the study of the morphology, physiology, flowering and geno-systematics of the Aloinae).**
Mem. Soc. Brot., Coimbra **1943** : **2** : Pp. 119.

The first part of this monograph deals with the morphology and physiology of the root, stem, leaf, flower and fruit. The mode of fertilization and the various factors that may affect fertility are discussed. It has been noticed that many species and varieties which are sterile in northern Europe set perfect seed in the botanical gardens of Portugal; others which proved sterile in Portugal are known to be fertile in S. Africa. *Aloe ciliaris* f. *Haworthii* Res. had never set seed, in spite of innumerable attempts at selfing and crossing, until 1940 when four capsules developed spontaneously on a specimen growing in Berlin-Dahlem and the progeny bred true to type, though none of them has set seed. A list is given of the interspecific crosses attempted and of the results obtained.

The form of the chromosomes is almost identical throughout the Aloinae but serves as a useful guide in distinguishing this subfamily from the subfamily Kniphofiinae. Many polyploids are known in the Aloinae but gene mutations seem to have been a more important factor in the evolution of the genera and species. A giant mutant of *Aloe ciliaris* Haw. found at Coimbra in 1937 may be a pentaploid hybrid between *A. ciliaris* and *A. striatula* Haw., although the cross has never been effected artificially; moreover the mutant is identical with *A. ciliaris* in all respects but size.

The phenotypical characters in this group, many of which have been used in differentiating the species, are exceedingly prone to modification by external influences. A revision is proposed of the systematics of the genera *Haworthia* and *Aloe*.

923. FAWCETT, G. L. 633.61(82)
La determinación de algunas nuevas variedades de caña plantadas en el pais. (**The determination of certain new cane varieties planted in the country**).
Rev. Industr. Agric. Tucumán 1943 : **33** : 5–10.

A key is given for the identification of many of the newer sugar cane varieties in Argentina, some of which are resistant to smut. Brief descriptions of the varieties are also furnished.

924. BORDEN, R. J. 633.61:519.271.3
Replication: The safeguard for uncontrolled variation.
Hawaii. Plant. Rec. 1943 : **47** : 135–53.

The author suggests that, as there is much natural variation in the sugar cane crop, it is better to have measurements or analyses made from many samples by means of rapid approximate methods than to spend an equivalent time making unnecessarily precise measurements on only a few samples.

925. BEAUCHAMP, C. E. 633.61:581.13:575(72.91)
Nourishment of sugar cane and its importance in the production of varieties.
Proc. 16th Annu. Conf. Asoc. Tecn. Azucareros, Cuba 1942 : 71–74.

The author reports experiments on the nutritional requirements of different varieties and advocates the production by hybridization of varieties with particular requirements for special areas.

926. CROSS, W. E. 633.61–2.451–1.521.6
Datos adicionales sobre el "carbón" en las distintas variedades de caña de azúcar. (**Additional data on "smut" in the different varieties of sugar cane**).
Bol. Estac. Exp. Agric., Tucuman 1943 : No. 43 : Pp. 13.

Observations made during 1942 and 1943 on a large number of sugar cane varieties, most of which were of Tucumán origin, indicate very different degrees of susceptibility to sugar cane smut. Although many were severely attacked, others were only slightly affected, whilst others again were apparently immune.

927. GRANER, E. A. 633.682:575.11
Genética de manihot. I. Hereditariedade da forma da folha e da coloração da película externa das raizes em *Manihot utilissima* Pohl. (**Genetics of cassava. I. Inheritance of leaf form and coloration of the root epidermis in *M. utilissima* Pohl**).
Bragantia, São Paulo 1942 : **2** : 13–22.

A study was made of 318 seedlings obtained from 500 seeds from an isolated plot of the cassava variety Vassourinha Paulista. Segregation was observed in leaf form, plants with narrow lobed leaves and broad lobed leaves being found in the ratio of 3 : 1. Anthocyanin coloration of the root epidermis was also found to be a simple dominant to white, inherited independently of leaf form.

The distinction between broad and narrow lobed leaves could only be made when the plants were grown under normal conditions of light. When grown in shade both genotypes produced leaves with broad lobes.

928. GRANER, E. A. 633.682:576.356.5:581.04
Tratamento de mandioca pela colchicina. II. Formas poliplóides obtidas. (**Treatment of cassava by colchicine. II. Polyploid forms obtained**).
Bragantia, São Paulo 1942 : **2** : 23–54.

Tetraploid and octoploid plants of cassava (*Manihot utilissima*) were produced by means of colchicine. The drug was applied to young shoots in 0·5% and 1·0% concentrations, both doses being equally effective. The tetraploids possessed larger stomata, wider leaflets, larger flowers and a tendency to slightly larger tubers than the corresponding diploids. The octoploids were stunted and deformed. The cytology of the tetraploid and octoploid plants was also studied, and was found to conform to the usual behaviour of colchicine treated plants.

929. 633.682:581.162
GRANER, E. A. 633.682:575.12:578.08
Notas sobre florescimento e frutificação da mandioca. (**Notes on flowering and fruit formation in cassava**).
Bragantia, São Paulo 1942 : **2** : 1–12.

Observations were made upon the floral biology of cassava, mainly on the variety Vassourinha Paulista. Crossing is made difficult owing to damage of the male flowers by the larvae of *Teleocoma crassipes* Aldrich. Apart from this, the method of artificial pollination, which is described, is relatively simple owing to the monoecious nature of the plant and the large size of the flowers. The few hybrids obtained have been propagated vegetatively; each clone is spatially isolated and the seeds arising naturally are then used for the production of an F_2 population. This, is spite of its obvious disadvantages, is the only practicable method of raising a large F_2 population so far evolved.

930. NORMANHA, E. S. and
BOOCK, O. J. 633.682.00.14(81)
Ensaios de variedades de mandioca na Estação Experimental de Ubatuba. (**Tests of manihot varieties at the Ubatuba Experimental Station**).
Bragantia, São Paulo 1942 : **2** : 521–59.

Tests of eleven varieties showed that the yield both of roots and of flour was highest in the variety Vassourinha. The next best variety was Santa. The yields of tops were much lower in these varieties than in certain others with lower root yields.
Data are also given on the chemical composition of the flour obtained from the different varieties.

STIMULANTS 633.7

931. LIMA, A. R. and 633.71:575"793"
FORSTER, R. 633.71:575–181
Uma forma gigante em *Nicotiana tabacum* L. (**A giant form in *N. Tabacum* L.**)
Bragantia, São Paulo 1942 : **2** : 111–13.

In a family of Virginia Bright tobacco that had been selfed for six generations 3 plants appeared in progeny No. 555 which remained in the vegetative stage, without flowering, throughout the season; cuttings taken from the top of the plants finally came into flower at the end of August, 4 months after the normal plants. Seeds obtained from the cuttings reproduced this giant type in the following year.

932. BRIEGER, F. G. and
FORSTER, R. 633.71:575.127.2:581.143.32
Tumores em certos híbridos do gênero *Nicotiana*. (**Tumours in certain hybrids of the genus *Nicotiana***).
Bragantia, São Paulo 1942 : **2** : 259–74.

Tumour formation has been observed in a number of interspecific *Nicotiana* hybrids involving the $n = 9$ species. Two such hybrids are described, namely *N. glauca* x *N. Langsdorffii*, where tumours formed on the stems but all the flowers and most of the leaves were normal, and *N. glauca* x *N. Sanderae*, where the leaves and flowers were also abnormally developed. When however *N. glauca* was pollinated from a *N. Langsdorffii* x *N. Sanderae* hybrid, the two types of abnormal plant appeared in the progeny in the ratio 1 : 1. The interpretation offered is that each of the species *N. Langsdorffii* and *N. Sanderae* contains a different recessive gene for tumour formation, the two being allelomorphic and only manifested when crossed with *N. glauca*. The two species in question also behave differently in crosses with *N. paniculata*; the hybrids from *N. Langsdorffii* are inviable and those from *N. Sanderae* grow to maturity.
A brief description is given of the development and histology of the tumours. Cellular inclusions were observed in many of the cells of the tumourous hybrids even in areas not directly affected by the tumours.

933. Kostoff, D., Gorbatscheva, A. and Dimitroff, P. 633.71:576.356.5:581.04:581.331.2
Die Vergrösserung der Zellen in auto- und allopolyploiden Tabakpflanzen. (**The enlargement of the cells in autopolyploid and allopolyploid tobacco plants**).
Z. Pflanzenz. 1943 : **25** : 112–16.
Measurements of pollen dimensions in diploid and derived autopolyploid and allopolyploid types of *Nicotiana* have shown that polyploids produced by the colchicine technique have larger cells. The size increase of autopolyploids is not significantly greater than that in the allopolyploids. Since naturally occurring species with higher chromosome numbers (presumed natural polyploids) do not exhibit cells larger than those of the wild types with lower numbers, the authors conclude that natural selection is unfavourable to types with large cells.

934. Allard, H. A. 633.71:581.143.26.035.1:581.9
Length-of-day behavior of *Nicotiana gossei*.
J. Agric. Res. 1943 : **67** : 459–64.
The results suggest that *Nicotiana Gossei* Domin is a long-day plant and that seeding is delayed by short-day conditions. This species grows wild in Australia where the maximum day length in summer is 13·6 hours but the author suggests that were it not for natural barriers, its photoperiodic response would have caused it to spread to higher latitudes.

935. Goodspeed, T. H. 633.71:582:581.9:575.129
The South American genetic groups of the genus *Nicotiana* and their distribution.
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 231–38.
Recent research has indicated that genetic groups rather than taxonomic sections should be used in subdividing genera. Six such groups are recognized for the genus *Nicotiana* in South America, viz. the Cavarillesii, corymbosa, acuminata, alata, paniculata and tomentosa groups; there is evidence also that the corymbosa and acuminata groups might well be lumped. These taxonomic units are described and details of their distributions given. The importance of environmental factors in determining the area of distribution is estimated, special importance being attached to moisture.
N. silvestris approaches the tomentosa group but is best treated independently. *N. rustica* and *N. Tabacum* are both amphidiploids formed probably by hybridization between species belonging to different genetic groups whose areas of distribution have happened to overlap.

936. Brieger, F. G., Lima, A. R., Forster, R., Costa, A. S. and Ribeiro dos Santos, S. 633.71–2.8–1.521.6
Ensaio de épocas de transplante para o fumo. (**Experiments on the times of planting out in tobacco**).
Bragantia, São Paulo 1942 : **2** : 295–310.
Several different tobacco varieties were grown at four experimental stations and planted out at different times of the year to ascertain whether any differences in the attack of the virus disease "vira-cabeça" (spotted wilt) could be observed.
The variety Sumatra V38 was most resistant, whilst Amarelinho V33 showed only slight resistance. No varieties yet tested are immune and the authors doubt whether any strains with a greater degree of resistance can be found.

937. Brieger, F. G., Lima, A. R. and Forster, R. 633.71–2.8–1.521.6:575.22
Comportamento de variedades e progênies de fumo na resistência ao "vira-cabeça". (**Behaviour of varieties and progenies of tobacco in resistance to "vira-cabeça"**).
Bragantia, São Paulo 1942 : **2** : 275–94.
A detailed comparison was made between various progenies of the tobacco varieties Virginia and

Sumatra in order to ascertain whether there was sufficient heterogeneity to form a basis for the selection of types more resistant to the virus disease "vira-cabeça" (spotted wilt).
A statistical analysis of the results indicated that the variation was too slight to be of use in selecting for increased disease resistance.

938. Krug, C. A. and Carvalho, A. 633.73:575.061.6
Genética de *Coffea*. V—Hereditariedade da coloração bronzeada das folhas de *Coffea arabica* L. (**Genetics of *Coffea*. V—Inheritance of the bronze coloration in the young leaves of *Coffea arabica* L.**).
Bragantia, São Paulo 1942 : **2** : 199–220.
A genetical analysis of leaf colour in *C. arabica* L. is presented. The three colour types, dark bronze, light bronze and green, are due to a single pair of allelomorphic genes for which the symbols *Br, br* are proposed. The dark bronze coloration is due to *Br Br*, light bronze to *Br br*, and green to the double recessive *br br*. Slight variations in the intensity of the dark bronze colour are thought to be due to modifying genes.
Evidence is presented to show that there is no correlation between leaf colour and the condition known as die-back.

939. Krug, C. A. and Carvalho, A. 633.73:575.061.6:575.116.1
Genética de *Coffea*. VI—Independência dos fatores *xc xc* (xanthocarpa) e *Br Br* (Bronze) em *Coffea arabica* L. [**Genetics of *Coffea*. VI—Independence of the factors *xc xc* (xanthocarpa) and *Br Br* (bronze) in *Coffea arabica* L.**)].
Bragantia, São Paulo 1942 : **2** : 221–30.
It is shown that there is no linkage between the genes controlling yellow fruit colour and those responsible for the bronze coloration of the young leaves.

940. Krug, C. A. and Carvalho, A. 633.73:575–181:575.11
Genética de *Coffea*. VII—Hereditariedade dos caracteres de *Coffea arabica* L. var. *maragogipe* Hort ex Froehner. (**Genetics of *Coffea*. VII—Inheritance of the characters of *Coffea arabica* L. var. *maragogipe* Hort. ex Froehner**).
Bragantia, São Paulo 1942 : **2** : 231–47.
A gigas variety of coffee, var. *maragogipe*, which is characterized by larger leaves, flowers and fruits and lower productivity than var. *typica* is shown to be determined by the almost completely dominant gene *Mg*.
Although the heterozygote *Mg mg* is practically indistinguishable from the homozygote, its productivity seems to be a little higher than that of the homozygote.

941. 633.73:581.47
Mendes, A. J. T. 633.73:581.483
Observações citológicas em *Coffea*. VI—Desenvolvimento do embrião e do endosperma em *Coffea arabica* L. (**Cytological observations in *Coffea*. VI—Development of embryo and endosperm in *C. arabica* L.**).
Bragantia, São Paulo 1942 : **2** : 115–28.
In view of the comments aroused by the description of the coffee seed published by Houk (see "Plant Breeding Abstracts", Vol. VII, Abst. 265) the question was re-investigated. The course of fertilization in coffee is described in detail. It is definitely established that, contrary to Houk's findings, the endosperm finally fills the seed, replacing the perisperm, which remains in the mature seed only in the form of the "silver skin". The perisperm itself is formed from the integument and not from the nucellus. The parchment sheath surrounding the seed is the endocarp of the fruit.

942. Silva, P. 633.74:575(81)
Instituto de Cacau da Bahia. Relatorio 1939. (**Bahia Cacao Institute. Report for 1939**).
Bahia 1939 : Pp. 76.
Studies of self-compatibility and incompatibility in cacao have been made and the cacao flower

has once more been shown to be entomophilous. Some of the insects which serve as pollinating agents have been identified.
Yield data have served as a basis for plant selection and certain further mutations have been recorded in *Theobroma leiocarpa*; one was an albino type and is being studied further on account of its probable economic value.

AROMATIC PLANTS 633.8

943. GARCIA, J. G. 633.812:576.312.35
Contribuïção para o estudo cário-sistemático do género *Lavandula* L. (**Contribution towards the karyo-systematic study of the genus *Lavandula* L.**).
Bol. Soc. Brot. 1942 : **16** : 183–93.

Root tip counts showed the somatic chromosome number to be 24 in *L. multifida* L., 30 in *L. Stoechas* L., *L. viridis* L'Hérit and *L. pedunculata* Cav. and 54 in *L. officinalis* Chaix, *L. latifolia* Vill. and *L. Panata* Boiss. The group with $2n = 54$ are regarded as secondary hexaploids with a basic number 9, whilst the $2n = 24$ forms are regarded as tetraploids from the true basis of 6; the 30-chromosome species are regarded as hybrids between the two groups. Meiosis is regular in *L. Stoechas*, 15 bivalents being formed.

CONDIMENTS 633.84

944. POPOFF, P. 633.842:577.16:581.02:582
Untersuchungen über den Einfluss einiger genetischer und ökologischer Faktoren auf Ertrag und biologischen Wert von Paprika (*Capsicum annuum* L.) unter besonderer Berücksichtigung des Ascorbinsäuregehaltes. [**Investigations on the influence of some genetic and ecological factors on the yield and biological value of paprika (*Capsicum annuum* L.) with special reference to the ascorbic acid content**].
Gartenbauwiss. 1943 : **17** : 446–92.

This paper opens with an account of the geographical distribution of *C. annuum* which is native to tropical America and a short discussion of the centres of origin recognized by other authors is given. The species was introduced into the Old World by the Spaniards and reached eastern Europe via the Balkans, afterwards spreading to Hungary and southern Russia. A secondary centre of origin is believed to have developed in Bulgaria.
The classification of types adopted by the writer is based on that of Irish; the Linnaean species *C. annuum* is kept and subdivided into subspecies and varieties. Varieties are also classified on their ecological behaviour and according to their biological value, a quality defined as the complex of physical and chemical characters that render the fruits suitable for human nutrition.
Much variation between varieties has been observed in the following characters: size, form and shape of fruit, earliness, and ascorbic acid, carotene and capsaicin contents.
Experiments were performed in order to determine the effect of environmental conditions on the characters: total yield of fruits, number of fruits per plant, fruit weight, weight of vegetative matter, plant height, percentage dry weight of fruits, and the content of total nitrogen, protein nitrogen, total sugars, monosaccharides, disaccharides, carotene and ascorbic acid, in the fruit. Selected varieties were grown in the greenhouse, also in the open, and the effects of planting in seed boxes, with or without a glass cover, and with or without manure, were noted. The importance of temperature, water relations and sunshine is also discussed. In view of the great variability in fruit characters, adequate sampling technique is essential.
Fruit yield was lowest in the subspecies *microcarpum* and greatest in var. *longum* of the subspecies *macrocarpum*. The former, however, is earlier than the latter.
Ascorbic acid content was determined at two stages in maturity, viz. at market ripeness and at full ripeness. Market ripe varieties of subspecies *microcarpum* had the highest value of ascorbic acid per fresh weight of fruit, the quantity decreasing through var. *longum* and being least in var. *grossum*. A correlation was found however between a high concentration of ascorbic acid and percentage dry weight, and when the ascorbic acid content was expressed in proportion to the dry weight of the fruit, the lowest value was found in subspecies *microcarpum* and the highest in var. *grossum*. At full ripening, a considerable increase in the ascorbic acid content was noted in most cases although exceptional decreases were also observed. In the case of subspecies *microcarpum*

and the forms of varieties *longum* and *grossum* with thick flesh, only a slight increase or a decrease in the content of vitamin per dry matter was noticed. The remaining types of subspecies *macrocarpum* showed a definite increase.

No correlation between ascorbic acid content and degree of pigmentation or between the former and the presence of capsaicin could be demonstrated. Capsaicin is an objectionable substance and should be eliminated by selection; its formation does not appear to be correlated with important morphological or biochemical characteristics.

All varieties had a low carotene content when the fruits were young but this rose rapidly during maturity although different varieties exhibit conspicuous differences in their absolute carotene contents. Selection should be able to develop promising lines.

OIL PLANTS 633.85

945. Krug, C. A.,
Mendes, P. T. and
Sousa, O. F. de 633.853.55:575(81)

Melhoramento da mamoneira (*Ricinus communis* L.) I. Plano geral dos trabalhos em execução nas secções de genética e plantas oleaginosas do Instituto Agronômico do Estado de São Paulo. II. Observações gerais sobre a variabilidade do gênero *Ricinus*. III. Primeira sêrie de ensaios de variedades (1937/38–1938/39). [**Improvement of castor oil plant (*Ricinus communis* L.). I. General plan of work in the sections of genetics and oil plants of the State Agronomic Institute of São Paulo. II. General observations on the variability of the genus *Ricinus*. III. First series of variety tests (1937/38–1938/39)**].
Bragantia, São Paulo 1942 : **2** : 129–154 : 155–197; 1943 : **3** : 85–122.

Brazil is now the biggest exporter of castor oil seeds in the world. In the first part of this genetical study the authors give a botanical description of the species. The first step in the breeding work was to make an extensive collection of types, of which some 200 are now growing. A preliminary study of these has enabled some 30–50 of the best types to be singled out for more detailed study. Six dwarf varieties and eight tall varieties were chosen for immediate testing in different localities.

Most varieties proved to be heterozygous and individual plant selection, followed by a study of the behaviour of the progenies, was started in 1936, the characters on which selection was based being economic value of the variety, number of inflorescences and their conformation, total yield of seed, earliness, freedom from dehiscence and oil percentage of the seeds. Bagging is not sufficient to ensure self-pollination, since the plant is monoecious, and artificial selfing must be performed. The estimations of oil content are carried out by the Section of Agricultural and Technological Chemistry, which analyses many thousands of samples every year. The best progenies are selected at the end of the year and the seed of these progenies is mixed for testing in different localities. The best progenies were separated into three groups, dwarf, medium and tall. Four series of selections are carried on permanently; these are as follows: (1) plants which combine all the favourable characters, in an attempt to isolate lines which could soon be used to replace the commonly cultivated varieties, (2) plants selected solely on their total yield, (3) plants selected exclusively on the oil content of their seeds, and (4) plants selected exclusively on the score of the length of their fruit bunches.

Hybridizations, both controlled and uncontrolled, have also been made. A series of crosses was made between Var. 37, which is the earliest and one of the varieties with the highest oil content and some of the highest yielding varieties. The F_1 generations obtained were very mixed; F_2 selections were made in various localities. The selfed progenies were grown in the localities where they were selected. Unselfed progenies were also taken for selection in the F_3.

While the breeding work was in progress seed multiplication of the two best varieties in the collection was carried out; a total of 5011 kg. of seed was distributed in 1938 and 25594 kg. in 1939.

In Part II, attention is called to the great variation that exists in almost all characters studied. Data are given regarding this variation in respect of habit of growth, number and length of internodes, type of branching, stem colour, glaucousness, earliness, yield per plant, oil content of the seed and characters of the leaf, inflorescence, fruit cluster, fruits and seeds.

The dwarf varieties are characterized by a large number of very short internodes. Most of the varieties in cultivation are very heterogeneous in seed characters and one of the first steps in breeding will be to produce more uniform types. As a rule, the earliest maturity is found among the varieties of medium height. The yields per plant varied from 13 grm. to 2549 grm., the highest yields being obtained from tall varieties. Oil content varied from 35·51% to 58·00% in the whole seeds and from 50·51% to 71·50% in the shelled seeds. There seems therefore to be an ample field for selection for this, as for most of the other characters mentioned.
The results of the regional variety tests are reported in Part III; four typical localities were chosen and details are given of the conduct of the experiments. Among the tall varieties, Zanzibar and Sanguinea gave the best yields, the latter variety having seeds more of the type preferred on the market.
In most localities the dwarf varieties yielded less than the tall but the reverse was observed at Campinas. The dwarf forms however yielded almost as well in the second as in the first year and for this reason, combined with their greater ease of harvesting, their cultivation is recommended. Among the dwarf varieties, Nos. 14 and 38 were the best in most localities, whilst No. 45 seemed most drought resistant.

946. KNAPP, O. 633.853.55:581.192:575.42
Versuche zur Züchtung einer giftfreien Ricinussorte. (**Experiments on the breeding of a non-toxic *Ricinus* variety**).
Züchter 1943 : **15** : 97–100.

The author has tested 1760 plants of *R. communis* var. *sangineus* and *R.c.* var. *minor* for their ricin content, using an agglutination analytical technique. No ricin-free plants were found nor were any significant differences in ricin content established between strains, in spite of the large fluctuations observed.

947. KRIJTHE, J. M. 633.854.797:581.04
(**On the influence of colchicine upon the anthers of *Carthamus tinctorius* L.**).
Proc. Acad. Sci. Amst. 1942 : **45** : 283–87.
[From Gartenbauwiss. 1942 : **17** : p. (40)].

The effect on the anthers of filling the space in the flower buds with a colchicine agar mixture or a colchicine solution was to cause various disturbances of the normal processes such as the lack of a spindle in the dividing cells and the appearance of openings in cell walls of the pollen mother cells through which strands of plasma emerged. R. M. I.

RUBBER PLANTS 633.91

948. 633.913:575.42(47)
KUPCOV, A. I. 575.41:631.524
(**The utilization of natural selection in plant-breeding**).
J. Gen. Biol. U.S.S.R. 1943 : **4** : 87–115.

Taraxacum kok-saghyz is cited as an example of a species consisting of a complex of forms whose ecological and geographical differentiation has only just started. All the wild populations of it are genetically extremely mixed, and the same types occur in more or less all of them, and in the same proportions. The characters affected by this variation are leaf type and consistency, peduncle characters and inflorescence type. The forms with the most dissected leaves are those with the longest vegetation period, as the degree of dissection increases gradually throughout the ontogeny. The proportion of annuals to biennials varies according to environment but when tested at any one place, populations of different provenance show very little difference in the proportions.
The next type of differentiation is exemplified by *Parthenium argentatum*. Here different localities are characterized by different ecotypes but the populations in each are composed of the same genetic types, though differences between them are observable in the proportional representation of the types. The most polymorphic populations are found in the Sierra de Grunidora and the most uniform in Texas. Stapledon has described a similar state of affairs in the cocksfoot populations of Wales. Other examples cited are lucerne and sainfoin, many species referred to by Hagerup (cf. "Plant Breeding Abstracts", Vol. II, Abst. 381, and Vol. IV, Abst. 253) and safflower.

The third type of distribution, where each area is characterized by a distinct ecotype represented by distinct genetic types confined to that area, is exemplified by *Scorzonera tau-saghyz* in the Kara-tau. Six separate species or subspecies have been described, differing in leaf form, type of peduncle and inflorescence, habit of growth and seed characters; each species comprises a complex of forms, none of which is found among any of the other species. Other examples are the collective species *Apocynum venetum* L., *Secale montanum* Guss. and many cultivated species. When the distribution is of this last type great possibilities are presented for selection of desirable types from among the existing ecotypes. This has led to the production of some of the most noteworthy products of plant breeding. Instances cited are the Pskov flax varieties; Manchurian soya beans; Italian hemps; extremely disease resistant far eastern forms of *Sesamum indicum*; large seeded Mediterranean linseeds; and southern Russian edible sunflowers.

Even selection of ecotypes already existing in wild populations can give rise to improved forms suitable for cultivation; this has been done for instance with cocksfoot and yellow lucerne. Forms of *Apocynum lancifolium* have been selected with an average stem height of 126 cm., and fibre yield of 0·5 grm. per stem, and a fibre length of 15·8 mm.; forms of *A. scabrum* have been found with a stem height of 136 cm., a fibre yield of 1·2 grm. per stem and a fibre length of 18·1 mm.

In tau-saghyz the largest roots are found in the high altitude humid zones of the Kara Tau, whilst the forms from the lower zones with lesser rainfall have a slower rate of growth but come into flower earlier. The highest yields of root and rubber have been obtained from the forms from Dželagan-Ata. Owing to the sharp genotypical differentiation of the ecotypes in this plant, these differences are reproduced in the offspring.

When a species is introduced into a country with very different climatic conditions it frequently undergoes radical changes resulting from natural selection, as witnessed by the work of Harlan and Martini (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 259) and others. Subtropical species often contain certain hardy forms which are selected to the exclusion of all others during acclimatization; this has happened in *Acacia dealbata* Link, which has formed a perfectly adapted local ecotype in Sukhum. Again, when a wild plant is transferred to cultivated conditions, natural selection largely ceases to operate and many changes may result. Thus the wild kok-saghyz comprises a great number of different types with varying phasic requirements. All these behave alike, as biennials, under the rigorous conditions of the Tian Shan but under cultivation some behave as annuals and some as biennials. If seed from the first and second year flowers is sown separately, two different types will result. The biennial types have larger roots than the annuals and it follows that better yields can be ensured by selecting the seed from the second year flowers.

The differences are still more pronounced in tau-saghyz; only about 10% of the individuals flower even in the second year, and about 20–30% in the third year; the rest may take up to the eighth or even tenth year before they flower. Here rapidity of flowering is correlated with large roots, and selection of the early flowering forms also serves to produce a race with larger roots and hence increased yield of rubber. Thus in both these species selection will probably lead ultimately to a biennial type as in sugar beet. Tau-saghyz plants grown in Moscow or Leningrad do not undergo the summer dormancy period that characterizes them in their native habitat; when grown in irrigated fields in Central Asia, however, though the majority of plants undergo summer dormancy, some 10% remain green and grow throughout the summer. These types have a selective value and will ultimately tend to preponderate. About 90% of the plants fall prey to some insect or other pest and the survivors are expected to display a higher degree of adaptation to cultivated conditions.

Guayule seeds require a prolonged period of moisture at a temperature not lower than 15° C. before they will germinate. This prevents them germinating prematurely in their native habitat but under cultivation in the U.S.S.R. this character is an impediment to cultivation. A few seeds germinate more rapidly however and from these it is expected that a new race distinguished by quick germination will be established. These forms unfortunately often have a lower rubber content.

Many of the species that accompany a plant in the wild state may, if introduced with it into cultivation, become serious weeds. This has happened with such species as *Taraxacum magnum*, *T. brevicorniculatum* and *T. multiscaposum* in fields of kok-saghyz, and *Parthenium incanum* in fields of guayule.

949. Artschwager, E. and McGuire, R. C. 633.913:581.4
Contribution to the morphology and anatomy of the Russian dandelion (*Taraxacum kok-saghyz*).
Tech. Bull. U.S. Dep. Agric. 1943 : No. 843 : Pp. 24.
The authors have subjected the Russian dandelion to a detailed morphological and anatomical investigation, paying special attention to the phloem elements and their relation to the latex tubes.

950. Kupzow, A. J. 633.913:581.45:575.42
Division of leaf blade in kok-saghyz as a character of breeding value.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1942 : **39** : 22–26.
Evidence is presented to show that the division of the leaf blade in kok-saghyz is of value to breeders as an indirect indication of root size, plants with pinnate leaves giving larger roots than those with entire or lobed leaves. The character is somewhat variable, good growing conditions giving a larger percentage of pinnate types and hence selection on leaf character is used as an adjunct to root selection rather than an alternative.

951. Arias, A. C. 633.913:581.9(72)
Estudios climatológicos. Areas geográficas de dispersión. *Parthenium argentatum, Hevea brasiliensis, Castilloa elastica.* (**Climatological studies. Geographical areas of distribution. *P. argentatum, H. brasiliensis, C. elastica*).
Secretaría de Agricultura y Fomento, Dirección de Geografía, Meteorología e Hidrología, México 1942 : Pp. 112.
The author gives detailed meteorological information on the Mexican districts in which the rubber-producing plant guayule (*Parthenium argentatum*) is grown, comparing these districts with others into which it is thought the plant might be introduced.
For Pará rubber (*Hevea brasiliensis*) a climatological survey of the main rubber-producing countries of the world is presented, followed by a section dealing with the possibilities of extending the cultivation of this plant into Mexico. Meteorological data are given of the most suitable areas for rubber cultivation, chiefly the tropical regions of the more southerly Mexican states.
The distribution of *Castilloa elastica* in Mexico is also treated.
Three maps are included with the work, showing the climatological zones of Mexico in relation to the extent of cultivation of the rubber-bearing plants under survey. J. G. H.

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952. Kessler, H. 634/5:581.6
Die Bedeutung der Sortenwahl bei der Erstellung von Gefrierkonserven aus Obst und Gemüse. (**The importance of the choice of variety in the preparation of frozen fruit and vegetables**).
Schweiz. Z. Obst- u. Weinb. 1943 : **52** : 548–64.
A discussion of the preservation of fruit and vegetables by the freezing method and of the qualities necessary, with special reference to peas, beans, cherries and strawberries, is presented. R. M. I.

953. Sengbusch, R. von. 634/5:581.6:575
Probleme und Zielsetzung der Gemüse- und Obstzüchtung in Verbindung mit der Konservierung. (**Problems and objectives of vegetable and fruit breeding in connexion with food preservation**).
Züchter 1943 : **15** : 78–90.
The author reviews the following types of food preservation: salting, pickling, jam making, fruit juice extraction, dehydration, canning and freezing. The qualities desired in these processes are indicated and the part that breeders can play in achieving them is stressed.

954. Nilsson, F. 634:575
Förutsättningar och arbetsuppgifter för växtförädlingen av fruktträd. (**The essential basis and tasks of fruit tree breeding**).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 5–16.
The application of breeding to fruit trees is relatively recent in Sweden. The severe winters from 1939–42 have shown the need for new hardy fruit varieties of good quality, suitable to Swedish

conditions, reliable in yield, not susceptible to damage by sprays used in pest control, and suitable for canning. The stocks used must also be of good quality and the relation between scion and stock must be studied.

Achievements in fruit breeding in England and the U.S.A. are outlined and the role of mutations, hybridization and selection and the production of high chromosome types is explained. Finally some varieties are enumerated that are likely to be of use in hybridization to improve existing varieties, including some used as stocks, in Sweden.

Artificial cold treatment is useful in eliminating unwanted types at an early stage in breeding for hardiness and similarly infection with the usual fungous diseases will eliminate susceptible forms. The bibliography contains Scandinavian references as well as English.

955. 634:575(65)

Comptes rendus de l'expérimentation fruitière en Algérie. (**Report on research on fruit trees in Algeria**).
Bull. Agric., Algérie 1942 : No. 92 : Pp. 47.

The report on genetics includes an article on the low productivity of the clementine, which is very irregular and often bears only once in three years. Lack of water, cold, wind or too severe pruning will all cause a drop in production. Certain trees are known that bear regularly every year and from one of these a number of grafts have been taken for observation. It is suggested that a lack of selection in making the grafts may have led to a decrease in productivity. The report proceeds to list the varieties of olive cultivated in Oran, the results of grafting pear varieties on quince and the yield, etc., of varieties of apple, peach, apricot, plum and pecan.

R. M. I.

956. 634:581.036.5:581.145.1

Gross, E. 634.23:581.036.5:581.145.1
Untersuchungen über den Einfluss von Kältebehandlung auf einige Obstarten. (**Investigations on the influence of cold treatment on some fruit species**).
Gartenbauwiss. 1943 : **17** : 295–303.

Experiments on the effect of various low temperature treatments on the induction of flowering in fruit trees are reported. Varietal differences in the reaction of cherry varieties have been demonstrated.

957. Strunck, R. and
Waschneck, A. 634–2.111–1.521.6:581.165.711(43)
Untersuchungen über den Einfluss des Standortes und der Pflege auf die Frostschäden an Obstbäumen. (**Investigations on the influence of locality and cultivation on the frost damage of fruit trees**).
Gartenbauwiss. 1943 : **17** : 273–94.

This paper includes a discussion on the varietal differences in susceptibility to winter killing found among cherries, apples and pears. These are discussed in relation to environmental factors and the importance of suitable stocks (including stem-builders) is stressed.

958. 634.00.14(48.5)

Lundin, Y. 634(48.5)
S.P.F:s nya fruktsortlistor. (**The Swedish Pomological Association's new lists of fruit varieties**).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 176–81.

In a lecture held before a meeting of the Swedish Pomological Association in August, 1943, the author re-emphasized that a substantial reduction in the number of varieties is a vital condition for the improvement of fruit growing in Sweden. A list of suitable varieties compiled by the Pomological Association is discussed. The country has been divided into 6 zones and the regions suitable for each variety are stated. The list contains 25 apple, 13 pear, 9 plum and 8 cherry varieties.

959. 634.00.15(48.5)

Nilsson, F. 634.00.14(48.5)
Fruktodlarna och försöksverksamheten. (**Fruit growers and research**).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 230–36.

The development of research on fruit cultivation in Sweden is outlined with an account of the functions of the various research centres, and the work on variety trials of scions and stocks, frost resistance and keeping quality.

960. TRENKLE, R. 634.1/2–1.524
Primitivsorten und deren Bedeutung für die Leistungssteigerung im Obstbau.
(**Primitive varieties and their importance in increasing the performance of fruit trees**).
Dtsch. Obstbau 1942 : No. 6 : 101–06.
[From Gartenbauwiss. 1942 : **17** : (46)–(47)].
This is an evaluation of local varieties of fruit trees with which the German reviewer heartily disagrees on some fundamental points. R. M. I.

961. KALMYKOV, S. S. 634.1(47)
(**A large-fruited species of hawthorn**).
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V. R. Viljjamsa (Bull. V. R. Williams Kazah. Inst. Agric.) 1940 : No. 7–8 : 19–22.
This edible species of hawthorn grows wild in southern Kazahstan and the fruits find a ready sale in the towns, and at a fairly high price. The tree is described. It flowers late—between the end of May or beginning of June in Kazahstan—and thereby avoids the danger from late spring frosts. The fruit ripens in October, and the average yield per tree is about 50 kg. The fruit is large, about 25 mm. in diameter, flattened, with prominent ribs, yellow in colour, sometimes with a rosy tinge and red spots. It contains 2 or 3 pips forming about 20 per cent. by weight. The flesh is tender, juicy and with a strawberry flavour, acidity and sweetness are suitably blended. It contains 14·7 per cent. of sugar and 0·77 per cent. of acids. Though soft, the fruits will stand transport, and do not easily decay. Experiments in making jam, fillings for sweets, and pulp have shown that the fruit contains a high proportion of pectins, and that the products made from it are satisfactory. Experiments are also being made to find means of bringing the species under cultivation and to improve its qualities. An obstacle to its propagation and improvement is the difficulty of making the seeds germinate in under 2 or 3 years. I. Z.

962. 634.11:575(47)
GURJEV, P. G. 634.22:575(47)
(**New kinds of apple and plum for the Leningrad Territory**).
Plodovo-Jagodnye Kul'tury (Fruit Crops) 1940 : No. 3 : 14–18.
A description is given of four new kinds of apple and two of plum produced at the Ore Dez horticultural field station: (1) Albino, from Sujslep x Yellow Noble; (2) Kolhoznoe, from Antonovka x Signe Tillisch; (3) Pearl Reinette, from Reinette green x Reinette Orleans; (4) Reinette gray, from Borovinka x Reinette Blenheim; (5) Viola plum, of unknown origin; and (6) Ciana, obtained from the seed of an ordinary Hungarian plum. All these are said to have shown great winter hardiness and to have produced abundant crops. H. F.

963. LEVOŠIN, V. K. 634.11:575.247
(**The origin of forms within a clone in the apple**).
Plodovo-Jagodnye Kul'tury (Fruit Crops) 1940 : No. 3 : 3–13.
Investigations carried out between 1935–39 in the Saratov Territory (Lower Volga) showed that among the numerous types of Anise apple grown there, a variety described as striped Anise (pink) occurs in many forms, occupying as it were an intermediate position between the oldest Anise striped (gray) and Anise russet. The author assumes that the polymorphism displayed by the striped pink type is due to the environmental influences that have operated over a number of years. A survey revealed a number of new bud variations on the crown branches of 120–130 years old trees, which resembled the russet type. Further tests proved that the new apple is superior in taste and keeping quality to those produced by the maternal tree. H. F.

964. ASCHAN, K. 634.11:576.356.5
Fortsatta undersökningar rörande avkomman av triploida äpplesorter.
(**Further investigations on the offspring of triploid apple varieties**).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 61–70.
Seven tetraploid seedlings have been found in the offspring of triploid apple varieties at Alnarp, 3 of them originating from Belle de Boskoop. The pollen from one of the two tetraploid seedlings raised by Nilsson-Ehle, which flowered for the first time in 1943, was found to be considerably bigger than pollen of a diploid variety and to be of equal germinating capacity. Measurement showed that stomata of diploid varieties are smaller than those of triploid and tetraploid varieties, the difference between the two latter being small. V. H. G.

965. 634.11:576.356.5
JOHANSSON, E. 634.13:576.356.5
Undersökningar rörande högkromosomiga äpple- och päronträd. (**Investigations on apple and pear trees with high chromosome numbers**).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 55–60.

The tetraploid apple seedling obtained at Alnarp from the cross Belle de Boskoop x Filippa and grafted on various stocks in 1938 flowered for the first time in 1943 on EM IX. There were 5 trusses with 14, partly very small, blossoms. Flowering coincided approximately with that of the parent varieties. The pollen was markedly bigger than that of either parent. Pollinations of Early McIntosh, Cox's Orange and Laxton's Superb by the tetraploid produced a fair number of seeds, the fruits being typical of the female parent variety. Only one malformed fruit which was of poor flavour but of high vitamin C content developed from pollination of the tetraploid blossoms with Early McIntosh. The investigations will be continued with the aim of producing new valuable triploid varieties from crosses of the tetraploid with diploid varieties.
Brief mention is made of the Alnarp breeding work with pears. Some types with a higher chromosome number than 51 have been found, but none definitely known to contain 68 chromosomes. Incidentally the varieties Olivier de Serres, Souvenir du Congrès and Winter Williams were found to be diploid.

966. EWERT. 634.11:581.162.5:576.356.5
Eigene Erfahrungen über die Fruchtbarkeit triploider Apfelsorten. (**My experiences on the fertility of triploid apple varieties**).
Dtsch. Obstbau 1942 : **57** : 81–83.
[From Gartenbauwiss. 1942 : **17** : p. (46)].

Triploid varieties such as Rheinischer Bohnapfel show as good fertility as diploid varieties if care is taken to provide a pollinator. If planted in a uniform stand the fertility decreases according to the distance from suitable pollinators. R. M. I.

967. BRYNER, W. 634.11:581.165.711:575
Zur Wahl des Saatgutes für die Anzucht von Apfelunterlagen. (**On the choice of seed for the raising of apple stocks**).
Schweiz. Z. Obst- u. Weinb. 1943 : **52** : p. 546.

Lists are given of a number of varieties of apple tested for their qualities as seed producers and which are to be grown for further tests for resistance to apple scab. R. M. I.

968. BUDAGOVSKIĬ, V. I. 634.11:581.165.711:575
(**Marga hndzôr, a dwarf apple**).
Plodovo-Jagodnye Kul'tury (Fruit Crops) 1940 : No. 3 : 19–23.

Field tests and morphological analysis showed that Marga hndzor (*Malus pumila*), a dwarf apple indigenous to Armenia, is identical with the French Paradise Malling type VIII. Its resistance, early maturity, heavy cropping and ease of vegetative propagation make it eminently suitable for use not only as a dwarf stock but as a basic strain for pure breeding. H. F.

969. WEIMARCK, H. 634.2:575.127.2:582(48.5)
Bidrag till Skånes Flora. 15. En spontan hybrid mellan slån och terson. (**Contribution to the Flora of Scania. 15. A spontaneous hybrid between sloe and bullace**).
Bot. Notiser 1942 : 218–26.
Medd. Lunds Bot. Mus. No. 57.

The identity of the sloe, bullace, and damson is discussed with descriptions of specimens, measurements of the fruits and other data collected by the author in his study of various trees in different parts of Sweden. His cytological examinations showed the following chromosome numbers: *Prunus spinosa* $n = 16$, $2n = 32$; *P. fruticans* $n = \pm 20$, $2n = 40$; *P. insititia* (bullace) $n = 24$, $2n = 48$; *P. insititia* (damson) $n = 24$, $2n = 48$; *P. insititia* (bullace) x *P. spinosa* $n = 20$, $2n = 40$. The hybrid with its intermediate chromosome number is regarded as pentaploid, the basic number for the genus being 8. It exhibited various meiotic irregularities, namely, lagging chromosomes, bridge formation and fragmentation and was also highly sterile.
The difficulty of distinguishing between the sloe x bullace and the sloe x damson hybrids is recognized and living specimens of both are being raised to throw light on this problem.

Announcing his intention of further contributing to the problem of the taxonomic relationships between the different types in *P. spinosa*, *P. insititia* and also between these two species, the writer discusses the finding of Mather (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1359). The systematic position of *P. fruticans* is also discussed.

970. WEIMARCK, H. 634.2:575.127.2:582(48.5)
Om pollenkorn och klyvöppningar hos *Prunus Insititia*, *P. spinosa* och hybriden dem emellan. (**On pollen grain and stomata of *P. insititia*, *P. spinosa* and the hybrid between them**).
Bot. Notiser 1943 : 389–98.
Medd. Lunds Bot. Mus. No. 70.

A list is given of herbarium specimens which the author regards as in all probability representing the hybrid *P. insititia* x *P. spinosa*, the former species including both bullace and damson. Variation in both species is discussed and the diagnostic characters before, during and after flowering are specified in as far as that is possible at the present stage of the author's study. The criterion after flowering is the size of the cells of the stomata. The most reliable diagnostic character should be the chromosome numbers, $2n = 32$ for *P. spinosa* and $2n = 48$ for *P. insititia*, as far as our present knowledge goes; but the determination of the chromosome number is tedious and not convenient at all developmental stages. So far, the author's study of the pollen grains and stomata has revealed relatively slight variation within the 2 species but a marked difference between them. The measurements for the hybrid *P. insititia* x *P. spinosa* are intermediate between those for the parent species. Three cases cited as exceeding the range of variation exhibited by either of the two parent species are stated to be hybrid forms.

971. WEIMARCK, H. 634.2:575.127.2:582(48.5)
Fältstudier 1943 inom släktet *Prunus*. (**1943 field studies within the genus *Prunus***).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 45–54.

In this report on some tours made in southern and central Sweden to study the differentiation within certain species and form groups of *Prunus* the results are discussed under the following heads: the systematic position of *P. insititia*, special attention being devoted to the identity and taxonomy of two types, the bullace and the damson; hybridization between *P. insititia* and *P. spinosa* (cf. "Plant Breeding Abstracts", Vol. XIII, Abst. 1337) and the fertility of the hybrids; chromosome numbers (cf. Absts 969 and 970); frost resistance; and new localities where *P. insititia* x *P. spinosa* hybrids have been found.
The common Swedish names for the bullace are discussed with historical notes.

972. KALMYKOV, S. 634.22(47)
(**The myrobalan in Kazahstan**).
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamsa (Bull. V.R. Williams Kazah. Inst. Agric.) 1940 : No. 1–2 : 15–17.

After a short description of the myrobalan, the appearance of the trees, its usual habitat, and fruit characteristics, the author gives some facts and figures about four varieties which have been selected at the Kazah Agricultural Institute. The fruits of these varieties are described as red, dark purple, yellow-amber, and greenish yellow respectively. The weight and dimensions of these fruits are also given, as well as the proportion by weight occupied by the stone. Improvements are being introduced by means of grafting, for which purpose the best available varieties of myrobalan, plum and apricot have been used. I. Z.

973. 634.22:581.192:582:578.088
VILLFORTH, F. 634.11:581.192:582:578.088
Die Aromastoffe im Obst und Gemüse. (**Aromatic substances in fruit and vegetables**).
Gartenbauwiss. 1943 : **17** : 382–96.

Chemical analyses have been made on the fruits of nine plum and twelve apple varieties. In the case of the plums, the quantity and composition of the outer wax coating were investigated and also the composition of the fruit juice. The pigments of the pericarp were subjected to chromatographic analysis. Varietal differences in respect of chemical constitution were noted, the relative proportions of volatile esters in the fruit juice being regarded as of special diagnostic

importance. The wax layer consists largely of hydrocarbons of high molecular weight and its composition, as of the fruit as a whole, is affected also by incident light, atmospheric conditions and stage in ripening.
Only the waxes of the apple varieties were studied. These also contained a considerable hydrocarbon fraction and could be utilized for diagnostic purposes. Light and atmospheric conditions have a marked effect on the concentrations of the components.

974. Flory, W. S. (jun.) and
Tomes, M. L. 634.22:581.331.2
Studies of plum pollen, its appearance and germination.
J. Agric. Res. 1943 : **67** : 337–58.
The percentages of normal pollen and also the pollen germination rates of several plum varieties have been investigated in three different seasons. There was a strong tendency for the percentage of normal pollen in a given variety to be consistent from year to year. Pollen fertility often varied considerably from flower to flower on the same tree so that a large well mixed sample was necessary. The proportion of germinating pollen was lower than the proportion of apparently normal pollen, though the two were usually correlated. The importance of selecting parents of high pollen fertility for breeding purposes is indicated.

975. Kovalev, N. V. 634.22–1.524(47)
[**Myrobalan (*Prunus cerasifera* Ehrh.), its varieties and the cultivated types**].
Plodovo-Jagodnye Kul'tury (Fruit Crops) 1940 : No. 3 : 32–39.
This is a critical ecological survey of the wild and cultivated trees classified under six main geographical groups: (1) the Balkan, having three varieties, (2) the Northern Caucasian, nine, (3) the Colchidic, twenty, (4) the Armenian-Iranian, six, (5) the Caspian, three, and (6) the Crimean, with 10. Mention is also made of some of the Central Asiatic, Kashgar and Indian types. Tests conducted at the Maïkop station and elsewhere proved the suitability of the species for canning and jam making. For the purpose of hybridization and selection, the Northern Caucasian varieties showed the greatest cold resistance, those from Western Georgia produced large fruit and abundant yield, whereas the drought resistant varieties grew in Armenia.

976. Moreira, S. and
Gurgel, J. T. A. 634.3:581.331.2
A fertilidade do polen e sua correlação com o número de sementes, em espécies e formas do gênero *Citrus*. (**Pollen fertility and its correlation with number of seeds in species and forms of the genus *Citrus***).
Bragantia, São Paulo 1941 : **1** : 669–711.
Aceto-carmine coloration was found to be a reliable test of pollen viability. Observations were also made on the form and size of the pollen grains. The Baía orange was found to be pollen sterile but was fertile as a seed parent. The Tahiti lemon, a presumed triploid, was both male and female sterile. The pollen fertility in the oranges varied from 0 to 90%; some varieties, such as Lima and Pera, which are self-sterile, had 37·1% and 9·3% of good pollen respectively, and are thought possibly to have sterile megaspores. The pollen fertility in limes and lemons varied from 50% to 80%, in tangerines it was generally above 60% and in grape-fruit and oranges, with the exception of Marsh Seedless, it was over 80%.
The variation in pollen fertility within the plant, and even within the variety and species, was generally small, but soil conditions and rootstock had a notable effect.
Data are given as to the average number of seeds per fruit in the different varieties. The coefficient of correlation between number of seeds and pollen fertility was 0·53. The number of seeds formed after open pollination and after selfing was about the same. On the other hand cross-pollination sometimes altered the results completely, as in the Baía orange, which is normally seedless, and bore fruits with up to 14 seeds after cross-pollination. An increased number of seeds was obtained in 6 other crosses, while 11 others gave a reduction and in a further 9 there was no difference.
In some crosses of calamondin x *Poncirus trifoliata* all the seedlings were maternal, whilst in other crosses both maternal and hybrid seedlings appeared. In general, the species and forms with the highest degree of polyembryony had a high percentage of viable pollen, though the converse was not always true.

977. Brieger, F. G. and Gurgel, J. T. A. 634.3:581.331.2:581.165.711
Influência do cavalo sobre a fertilidade do polen no cavaleiro, em *Citrus*. (**Influence of the rootstock on the pollen fertility of the scion in *Citrus***).
Bragantia, São Paulo 1941 : **1** : 713–57.
Statistical data are presented to show that the pollen fertility of a variety is affected by the rootstock on which it is grafted, certain combinations of varieties being more favourable for pollen production than others.

978. Bacchi, O. 634.3:581.481:576.37
Cytological observations in citrus: III. Megasporogenesis, fertilization, and polyembryony.
Bot. Gaz. 1943 : **105** : 221–25.
The course of megasporogenesis, fertilization and endosperm formation in *Citrus* spp. is described. Three types of polyembryony are mentioned: (*a*) nucellar buds, (*b*) cleavage polyembryony, and (*c*) polyembryony arising from the formation and fertilization of more than one embryo-sac per ovule.

979. Bacchi, O. 634.3:582:578.088
Indentificação colorimétrica em *Citrus*. (**Colorimetric identification of *Citrus***).
Bragantia, São Paulo 1943 : **3** : 179–87.
A colorimetric method for the identification of various *Citrus* species is described. Tests with Almen's reagent and with ferric chloride on an aqueous extract of the bark show that it is possible to differentiate *C. Aurantium*, *C. sinensis* and *C. limonia* from each other and from all other *Citrus* species. This method would be of use when a quick identification of an orchard stock is necessary in order to gauge its susceptibility to the new disease "tristeza".

980. Sigurd Arentsen, S. 634.3–2.411.4–1.521.6
Estudio de la susceptibilidad presentada por diversas especies y variedades de citrus al ataque de *Phytophthora citrophthora* (Sm. and Sm.) Leon. [**Study of the susceptibility presented by several species and varieties of citrus to the attack of *Phytophthora citrophthora* (Sm. and Sm.) Leon**].
Bol. Sanid. Veg., Santiago 1942 : **2** : No. 1 : 54–57.
It is shown that different citrus species exhibit different degrees of susceptibility to *Phytophthora citrophthora* when artificially inoculated. Varieties of the same species differ widely in this respect.

981. Noro, K. 634.31:575.247
(**A giant type of Unsyu orange "Matuki-wase"**).
Plant Breed. News. 1934 : **9** : 157–60.
Illustrations are shown of a giant mandarin orange, called by Tanaka Matuki-wase, which originated by bud mutation.

982. Wei, C. T. 634.31–2.4:576.16:631.521.6
(**Storage diseases of sweet oranges in Szechuan**).
Nanking J. 1940 : **9** : 239–68.
An account of the fungi attacking sweet oranges is presented and strains are differentiated in the species *Penicillium italicum* Wehmer, *P. digitatum* Sacc., *Diplodia natalensis* Evans and *Botrytis cinerea* Pers.

983. Mauri, N. 634.37(65)
Les figuiers cultivés en Algérie. (**The figs cultivated in Algeria**).
Bull. Agric. Algérie 1942 : No. 93 : Pp. 56.
Descriptions are given of a number of varieties of figs grown in Algeria; a physical analysis of the fresh fruit and a chemical analysis of the dried fruit are included. The varieties are classified according to their value as fresh fruit, and for drying or preserving. Details are given of their cultivation, harvesting and diseases, and suggestions for the improvement of the crop. R. M. I.

984. Brieger, F. G. and
Gurgel, J. T. A. 634.441:581.481
Poliembrionia em mangueira *Mangifera indica*, L.) (**Polyembryony in mango *M. indica*, L.**).
Bragantia, São Paulo 1942 : **2** : 481–87.

Some of the varieties examined, such as Oliveira Neto, showed a pronounced tendency towards the production of polyembryonic seeds, whilst other varieties produced none at all. Varieties such as Santa Alexandrina and Itamaracá, which produce no polyembryonic seedlings, are characterized by stronger growth.

NUTS 634.5

985. Graves, A. H. 634.53:575(74.6)
Report on chestnut breeding.
For. Leaves 1942 : **32** : 15–16.
[From For. Absts. 1943 : **5** : 16–17].

Chestnut breeding started at Hamden, Conn., in 1930, has resulted in 48 new hybrid combinations which are now being tested under various conditions.
One hundred young trees of *Castanea dentata* are undergoing trials for disease resistance with a view to their possible use as breeding stock.

986. Burkart, A. 634.58:581.47
Los frutos de las especies silvestres de *Arachis*. (**The fruits of the wild species of *Arachis*).**
Proc. 8th Amer. Sci. Congr., Wash. 1940 : **3** : 175–78.

The fruits of *A. villosa* and *A. pusilla* are described; they are bilocular and biseminal and this is taken as an indication that the genus *Arachis* belongs to the tribe Hedysareae. The fruit of *A. hypogaea* is thought to be derived from the bilocular form by an increase in the number of ovules, accompanied by a suppression of the constrictions between the sections.
It is also thought that the second species described could be crossed with *A. hypogaea*, thus producing new genetic types.

OTHER FRUITS 634.7

987. Bailey, L. H. 634.71:582
Species Batorum Boreali-Americana. VII. Canadenses.
Gentes Herbarum, Ithaca, N.Y. 1944 : **5** : 465–503.

The author continues his monographic work on the genus *Rubus* (cf. Abst. 988). This fascicle deals with the section *Canadenses*.

988. Bailey, L. H. 634.71:582(7)
Quidam Rubi tropicales: Certain Rubi of the occidental tropics.
Gentes Herbarum, Ithaca, N.Y. 1944 : **6** : 325–64.

In this fascicle, the author describes further species of the genus Rubus (cf. "Plant Breeding Abstracts", Vol. XIV, Abst. 304). The forms investigated include three widely distributed species of the section *Idaeobatus*, two Jamaican species, nine from Hispaniola and five from Panama.

989. Curl, A. L. and
Nelson, E. K. 634.715:581.192
The occurrence of citric and isocitric acid in blackberries and in dewberry hybrids.
J. Agric. Res. 1943 : **67** : 301–03.

The non-volatile acid content of the blackberries Brainerd, Crandall and Texas Wonder was shown to consist mainly of isocitric acid, whilst the dewberries Boysen and Young contained citric acid. It is tentatively assumed therefore that there may be a connexion between the type of berry and the principal acid which it contains.

990. Camp, W. H. 634.73:582:001.4:575.127.2:576.356.5
Another new name in *Vaccinium*.
Bull. Torrey Bot. Cl. 1944 : **71** : 179–80.

The name *V. Lamarckii* nom. nov. is proposed for the tetraploid plants formerly classed under *V. angustifolium* Ait. *V. Lamarckii* is synonymous with *V. pensilvanicum* Lamarck but not with *V. pensylvanicum* Miller. It does not hybridize with the parent diploid species, *V. angustifolium* but crosses readily with *V. corymbosum*.

991. Kobel, F. and
Schütz, F. 634.75:575(49.4)
Erdbeer-Neuzüchtung der Eidg. Versuchsanstalt Wädenswil. (**New strains of strawberries bred at the Federal Research Institute at Wädenswil**).
Schweiz. Z. Obst- u. Weinb. 1943 : **52** : 483–85.
A brief account of strawberry breeding in Switzerland begun in 1927, for improved quality, higher yield, better transport capacity, stronger growth, resistance to disease, etc., is given. Selfing produced weak seedlings. In 1934, two new hybrid strains were put on the market: Wädenswil I, an early variety from the cross Deutsch Evern x Osterfee, and Wädenswil II, a medium early variety from Späte von Leopoldshall x Hansa. A third strain, Wädenswil III is now available from the cross Wädenswil I x Hansa. It is medium early, the fruit spherical, moderately large, extraordinarily resistant to rain and dark scarlet with a fine gloss; the flesh is red throughout, well flavoured and sweet. The plant is sturdy, with strong upright fruiting stems, is a heavy cropper and long-lived but susceptible to *Mycosphaerella Fragariae*, which however only slightly affects the robust growth. The fruit is well suited to preservation by means of the freezing process. R. M. I.

992. Darrow, G. M. 634.75:575(73)
The Midland and Fairpeake strawberries.
Circ. U.S. Dep. Agric. 1944 : No. 694 : Pp. 4.
Midland (U.S.D.A. 1812) is derived from the cross Howard 17 (Premier) x Redheart; it is an early commercial variety with large fruits and good dessert quality. The skin is firm but there is a tendency towards fasciation.
Fairpeake (U.S.D.A. 2119) is derived from Chesapeake x Fairfax. It is a late variety with high quality fruits. These are attractive in appearance but also have a tendency to fasciation.

993. Herold, G. 634.75:577.8:581.162.5
Sortenprüfung bei Erdbeeren. (**Variety tests of strawberries**).
Schweiz. Z. Obst- u. Weinb. 1943 : **52** : 383–84. (Abst.).
[From Hort. Abst. 1943 : **13** : Abst. 1212].
Out of 76 varieties and strains of strawberries examined 12 varieties and 4 strains were morphologically pistillate, the remainder being morphologically hermaphrodite. The pistillate varieties did not show uniform fertility when cross-pollinated. The hermaphrodite forms that are partially pollen sterile need pollinators and even the yield of highly self-fertile varieties that may have happened to give a poor set may on occasion be improved by cross-pollination with suitable pollen.
Pollen transference by the wind and by bees and the role of nutrition on pollen degeneration demand further investigation.
Madame Montôt was resistant to leaf spot. Red spider resistance was greatest in hard leaved varieties such as Madame Montôt. No varietal differences in frost hardiness were noted except that early types suffered more severe damage than late ones.

VITICULTURE 634.8

994. Batista, A. de J. 634.835:581.6(81)
Santiago—Uma bôa uva para córte. (**Santiago—a good grape for mixing**).
Rev. Agron., S. Paulo 1943 : **7** : p. 554.
The vine Isabel, which is the most popular variety in the Rio Grande area, has a number of defects. The variety Santiago is described as producing wine of good quality suitable for mixing with that of Isabel.

995. Rodrian, and
Binstadt 634.835–2.111–1.521.6
Bericht über Frostschäden an Reben im Winter 1939/40 in den deutschen Weinbaugebieten. (**Report on the damage to vines caused by frost during the winter 1939/40 in the German vine-growing districts**).
Wein u. Rebe 1941 : **23** : 231–77.
[From Gartenbauwiss. 1942 : **17** : (33)–(34)].
The authors have assembled a comprehensive collection of data on the damage due to the winter frosts of 1939/40. Of the *V. vinifera* strains, Riesling, Traminer and Burgunder (including its

various sub-races) were everywhere relatively resistant, while Sylvaner, Müller-Thurgau and Portugieser suffered damage. The cause would appear to be in the later ripening wood of the susceptible varieties. The widely distributed stock, Kober 5 BB, was more damaged almost everywhere than the other stock varieties and for the same cause as the scions already mentioned.
R. M. I.

996. Scheu, G. 634.835–2.111–1.521.6:575
Die Frostschäden des Jahres 1939/40. Ein Beitrag zur Frage der Frostfestigkeit unserer Rebsorten vom Standpunkt des Rebenzüchters. (**The frost damage of the year 1939/40. A contribution to the question of the frost resistance of our grape varieties from the standpoint of the vine breeder**).
Wein u. Rebe 1942 : **24** : 47–64, 79–87.
[From Gartenbauwiss. 1942 : **17** : p. (62)].
The severe winter of 1939/40 has shown the importance of breeding frost resistant races of grapes. Winter-hardiness varies according to heredity and race and may be modified by external conditions. The author attributes much of the injury by frost to the inclemency of the weather of 1939 and the consequent failure of the wood of most of the *V. vinifera* races to ripen. Among the most resistant to frost were the important old races of vines, the white, red and blue Riesling, Blue Burgunder, various sub-races of Gutedel and some of the new strains bred in Germany. Of the *V. vinifera* races investigated, the wild grape ssp. *silvestris* was the most hardy and the ssp. *caucasica* the least hardy. Examples are given to show that there are very marked differences between the susceptibility to frost of the individual organs. There is a series of *vinifera* races whose suckers and shoots are fertile even after severe injury by frost. It is also noted that somatic mutations may alter the frost resistance.
R. M. I.

FORESTRY 634.9

997. Ording, A. 634.97:575
Vekstforedling av skogstraer. (**Tree breeding**).
Tidsskr. Skogbr. 1943 : **51**.
The author gives a popular account of tree breeding and indicates its possibilities in an intensive forestry programme. Mention is made of polyploidy in relation to increased growth and examples are given to show how rate of growth will vary with different varieties of the same species. Reference is made to growth measurements of "comb spruce" (kamgran) in Sweden which is shown to have 25 % greater diameter growth and 13 % greater height growth than other spruce types in the same stand.
F. F.

998. Sylvén, N. 634.97:575(48.5)
La sélection des arbres forestiers en Suède. (**Selection of forest trees in Sweden**).
Intersylva, Munich 1942 : **2** : 471–78.
The main substance of this paper will be found in the same author's article referred to in "Plant Breeding Abstracts", Vol. XIV, Abst. 318.

999. 634.97:575:576.356.5(48.9)
Larsen, C. S 634.97–1.521.5(48.9)
De enkelte Arters Anvendelse, Proveniens og Foraedling. (**The use, provenance and breeding of the various tree species**).
Svenska SkogsvFören. Tidskr. 1943 : **41** : 182–99.
In this lecture, given in March, 1943, at the Forestry College in Sweden, the author reviews, with historical notes, the main conifers and some deciduous tree species of Denmark (e.g. *Acer saccharum*, *Castanea vesca*, *Populus* sp.); the subject is treated from the standpoint of their provenance, uses in Danish forestry and present distribution in various parts of the country. Particular features such as suitability for wind-belts, resistance to salt-water spray, hardiness, resistance to various fungous diseases and soil requirements are mentioned.
In stressing the importance of provenance, it is pointed out that in Denmark it may often be advantageous to use a climatype from a country with a slightly more favourable climate than the Danish; the examples cited include (1) the Dutch oak, (2) the Czechoslovak beech, where there is the additional advantage of a better form type, and (3) the Polish aspen. Such importations should be made preferably from southern countries rather than the north.

The provenance problem for Denmark no longer involves only the finding of suitable foreign species but also the introduction of new races of Danish native species. Not only must the satisfactory climatype be found but also the best form types. Furthermore, it may be advantageous to grow hybrids between species already in cultivation, e.g. white spruce (Hvidgran) x Sitka spruce and the European x Japanese larch.

The contribution of Danish breeders to forest tree improvement is illustrated by reference to the following points: the technique of seed production by artificial pollination of "dwarf seed trees" obtained by grafts made from superior trees is used in the crossing of apparently highly desirable types and has been very successfully applied in crossing European and Japanese larch; these hybrids are very fast growing and have other valuable features. Heterosis has also been found in Japanese x Siberian larch, but this hybrid apparently needs a colder climate and might well be tried in Iceland.

A triploid has been obtained in a cross between European and West American larch (*L. occidentalis*) and it is hoped by crossing it with the Japanese species to get a tetraploid larch. The plants of one small sowing of triploid x diploid larch involving three species, show considerable variation. The aim here too was to get a tetraploid form for use in future breeding operations. Work is also being done with a tetraploid *Alnus subcordata*, some triploids and a number of normal diploids and hybrids between them, and a few plants have been produced that are completely hardy, excel the various original products in growth, are presumably of sylvicultural value and are easily propagated vegetatively, though their taxonomic position is impossible to define at present.

Turning from species crosses and polyploids to work on pure species, the new prospects opened up by modern forest tree breeding are seen. For example, on the basis of the oldest Danish plantings of Douglas fir and A. Oppermann's extensive research on provenance, it is possible to obtain a satisfactory climatype and a good form type. In future selection to improve the phenotype, resistance to *Phaeocryptopus Gäumanni* must, if necessary, be taken into account. The procedure adopted is described. Similar work has been done on red spruce [Danish Rødgran], resistance to *Chrysomyxa Abietis* and a few of the oldest and sylviculturally most valuable specimens appear to be immune to the disease.

Some aspens [*P. tremula*] of Polish provenance given by the Gosch Match Factories for research purposes seem to be surpassing trees of native provenance in growth. A way of propagating this valuable type of clones has been devised.

In spite of its difficulties, grafting of the best individuals is stressed as highly important in seed raising. Grafting on older trees direct in the forest is also useful. Good results have been obtained in the Danish arboretum with larch, ash, oak, aspen and some experiments with Douglas fir, red spruce (Rødgran) and Scotch pine (Skovfyr) seem promising. Training courses in the technique are contemplated for candidates for forest ranger's duties.

Danish breeders are fully aware of the value of factors such as polyploidy and heterosis in the utilization of foreign species in economic forestry.

1000. Langner, W. 634.97:576.16:575.3(4)
Le problème des races forestières dans la forêt Européenne. (**The tree race question in the forests of Europe**).
Intersylva, Munich 1942 : **2** : 479–88.

The importance, from the production standpoint, of using races well adapted to the locality of the stand has now been recognized in European countries. Seed certification in Europe and its possible control by legislation similar to the existing state regulations in Germany are discussed.

1001. *Nilsson, T. 634.97:581.192:575(48.5)
Skogsträdsförädling enligt kemisktkvalitativa riktlinjer. (**Forest tree breeding on the basis of chemical estimations of quality**).
Svensk PappTidn. 1943 : **46** : 507–13.

This paper deals mainly with the methods of breeding for chemical characteristics of forest trees. The breeder's aim is to evolve new races of Swedish forest trees with wood of such chemical composition as will produce the best possible raw materials for the wood industries. Indications of the various lines along which breeding must proceed must come in each separate case from the technical experts in the different industries. For this reason the collaboration of the Scientific

* An abridged translation of this paper is on file at the Bureau.

Academy of Engineers was sought and a committee of technical experts was set up to assist the Association for Forest Tree Breeding. A state grant was then asked for to study the influence of hereditary factors on the chemical composition of wood. This work was to be done at the central laboratory of the Cellulose Industry under Hägglund and in collaboration with the Forestry Institute and the Ekebo Institute. It is also hoped that the Permanent Institute for Wood Research will associate itself with the work.

In general the geneticists and the plant breeders view the problem of tree breeding for quality with optimism, but the cellulose chemists are more cautious as they realize the difficulties due to imperfect methods of analysis, our incomplete knowledge of the composition of wood constituents and the mechanisms whereby they are formed in the tree and finally the impossibility of foreseeing future industrial developments in the chemistry of wood.

The changes that might be effected in the chemical composition of wood by breeding may be broadly classed as:—

(1) Alteration of the relative proportions of the constituents of the wood—affecting either the percentage weights or both the percentage weight and volume; and (2) qualitative alteration of the main constituents of the wood, e.g., affecting the degree of polymerization of the cellulose, the composition of the resin or the pentosan content of the hemi-cellulose.

The possibility of breeding forest trees for chemical quality depends primarily on whether genetic differences in the composition of the wood are found, i.e. whether there are differences of this kind between various species, varieties, local races or individuals. Thus it is necessary to find by suitable methods of analysis variants in the desired direction whose variation may be presumed to be genetic and not due to environmental influences. The breeder then uses these variants as initial material and by selection, hybridization and chromosome reduplication, etc., he can alter the genotype in a particular direction. The resulting offspring must then undergo comparative field trials to decide ultimately, by analyses on the adult trees, whether any improvement has occurred. The ideal would be if these progeny tests could be at as early a stage as possible (preferably on plants a few years old) and from the data obtained it could be deduced what the adult trees would be like. In any event, the possibility of finding some such correlated characters between young and old trees should be explored.

Undoubtedly genetic variation does exist in the chemical structure, but its importance is debatable. There are not many investigations that shed direct light on these matters and it is difficult to glean anything from other analyses of wood, partly because the experimental material was not selected for the particular purpose of elucidating this problem and partly because such varied methods of analysis were used that the values obtained are not comparable. The well known and in many cases quite big difference between different kinds of trees is of minor interest here, since a certain degree of botanical affinity is essential in combining genetic characteristics of different plants by breeding. Synthesis of this kind is often possible between species. Staudinger and Huseman (1941) determined the content of cellulose and skeletal substance and the degree of polymerization in different sorts of trees including *Populus nigra*, *P. canadensis*, *P. tremula* and *P. alba*. *P. nigra* has a remarkably high cellulose content; *P. canadensis*, which holds an intermediate position, is a hybrid from *P. nigra*, which perhaps explains its relatively high content. Views are, however, more divided on the occurrence of variation within species, e.g. within spruce or pine. Analysis of wood from individual trees showed that some variation did exist. Sampling errors, caused by the variation between trees and the error in the chemical analysis, render any conclusions uncertain. Birch with a definite curly grain formation had a different chemical composition from ordinary birch. True curly grained wood can be regarded with certainty as being genetically conditioned. Otherwise experiments only show that there is a certain diversity in the various species of trees but give no indication as to its cause. No genetical analysis of material from field experiments has been made.

Some conclusions can be drawn however from variation in cultivated stands of the same age. This method has been used at Ekebo in endeavours to discover any plus-variants that might be suitable as initial material for breeding.

The material consisted of 149 trees of 70-year old planted spruce from Wrams-Gunnarstorp in Scania. The stand comprised comb, "brush" (borstgran), "band" (bandgran) and "plane" (plangran) spruces. The experiment aimed also at determining whether there were any differences in the wood of these types.

In the present experiments, the resin, lignin and cellulose content were determined by processes which are described.

No differences were found between the wood from trees with different types of branching habit, so that the more vigorous comb spruces apparently do not differ from the other types in chemical composition. On the other hand quite big individual differences were noted, the resin content varying from 0·52 to 2·73%, the lignin from 26·3 to 31·2% and the cellulose from 48·1 to 55·5%. Admittedly, the simplified methods of analysis used give quite large errors both in the chemical analyses and in the taking of samples. This aspect of the problem is examined in detail.

The degree of correlation between different constituents of the wood was examined. A statistically significant negative correlation was found between the cellulose content and lignin content. It is difficult to discover to what extent any deviations from the correlation are due to errors in the chemical analysis or how far the differences found are genotypic. The more uniform the environment the more likely it is that the differences found should be hereditarily conditioned and that one or more of the superior individuals may be found to have desirable genotypes. In any event, there is every reason to assume as a working hypothesis the existence of many different types and in breeding operations the plus-variants should be used as parents. Final proof can only be attained by comparative trials.

Light can be thrown on the interaction between environment and genotype by studying clonal variation. Results show that variation between trees of the same clone is clearly less than that between different clones. This applies specially to resin. Differences between clones from the same site must be regarded as dependent upon genotypic differences.

The possibility of changing the anatomy of timber by breeding is also discussed, the observation being here confined to fibre size.

The breeder tries to produce fast-growing races of forest trees, but according to Hägglund (1935) fast-grown timber has short and relatively thick fibres, so that the question arises whether the breeder's work necessarily leads to a deterioration in quality in such a case. The average fibre length is least next the pith, and then increases quite rapidly in the first annual rings; subsequently the increase falls off and after the 30–40th annual ring the average fibre length remains fairly constant except for a diminution in the last annual rings in very old trees. If a fast-growing tree is compared with a more compact specimen of the same dimensions, the former may be only 30 years old and will have only the short fibres found in young trees. The latter on the other hand may be 90 years old with the majority of the fibres developed between the 30th and 90th year and consequently of maximum length. It is therefore quite understandable that fast grown wood gives shorter fibres than compact wood, when trees of like dimensions are compared. The situation is, however, reversed if we compare annual rings of the same age, for the fast growing trees have longer and also thicker fibres; the increase in thickness is proportionally greater than in length. If annual rings at the same distance from the pith are compared, the longest fibres appear in the compact trees. Thus in two trees of the same dimensions, the compact will have the longer fibres, whereas on comparing two trees of the same age, the fast growing example will show the longest fibres.

The increment of a tree must be regarded as being dependent on the rate of cell division and the capacity of the cell for elongation. If one could keep these factors separate in the study of the growth capacity of the tree, it might be possible to produce by breeding trees with fibre dimensions such that their wood would be ideal for a particular purpose.

Polyploid plants have in general larger cells than their diploid basic form. In order to ascertain the effect of the chromosome number on the size of the wood elements H. Johnson and the author carried out the following cell measurements. In diploid and triploid aspens, the breadth and length of wood elements and the breadth of the wood ray cells are significantly larger in the triploids. The calculated cell volume increase was about 50%.

The results obtained show that there are variations of such an order in the chemical composition of the wood that there is hope that considerable improvements can be effected by breeding.

Breeding for quality of this kind takes a long time and though, by direct selection, some results can be obtained quite quickly, the other methods of breeding take longer. Moreover, there is the difficulty of foreseeing the trend of industrial developments and the future needs of industry. But one tendency, the need for diversity, can be discerned in the demands of the new industries for timber suited to their particular purposes. For this reason breeding should aim in various different directions so that if one type should prove inacceptable its exact opposite may well be what is required.

1002. LANGLET, O. 634.97–1.521.5(48.5)
Kvalitetsbeteckning å skogsfrö. (**Marking the quality of forest tree seed**).
Skogen 1942 : **29** : 315–18.

Measures to improve the hereditary constitution of Swedish forest trees include (1) breeding for yield combined with quality and (2) selection of mother trees in existing stands. The use of seed from such élite trees obviously necessitates some general scheme for designating its quality, which is dependent on provenance, condition, germination capacity and the mother tree. The author discusses in detail the categories proposed for and the method of using a classification of this kind, which was, however, in the first instance intended for use during the winter spruce seed harvest.

The role of progeny testing in determining quality is stressed and the significance of artificial pollination in the production of superior seed is pointed out, with an indication of the genetic basis of such methods of grading seed.

Price problems and the application of such a scheme of seed control are also briefly considered.

1003. 634.97.00.15(48.5)
Frågan om Skogsförsöksanstaltens omorganisation. (**The question of the reorganization of the Forestry Research Institute**).
Svensk PappTidn. 1943 : **46** : 472–73.

The various Swedish associations and other bodies interested in the development of forestry and the wood industry protest against the postponement of the reorganization of the Forestry Research Institute and point to the great importance of this Institute in assisting Swedish forestry to meet the urgent demands of present and future world conditions.

1004. * 634.972:575(48.5)
Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under år 1942. (**Annual report on the work of the Association for Forest Tree Breeding during the year 1942**).
Svensk PappTidn. 1943 : **46** : 451–58, 477–83, 501–06, 535–41, 572–77.

The work of the Association was continued and co-operation was maintained with state and other institutions and workers concerned with forestry development.

Extensive surveys were organized to record valuable local races of pine as well as suitable individual pine trees and stands for the production of high quality seed. Similar investigations should also be undertaken for other important forest trees and the spruce in particular.

The form variation, which is found even in very small spruce stands, apparently affects all the organs almost in the same degree and practically independently of each other. Hence, endless combinations of the different characteristics should be possible.

The spruce varies perhaps even more than the pine in branching habit and some of the variations have been found to be connected with valuable sylvicultural characteristics; the comb spruce is the most vigorous grower and least damaged by rot; the "brush" spruce† (borstgran) and the "band" spruce‡ (bandgran) are relatively nearly as vigorous, but both (and especially the latter) are highly susceptible to rot. The comb spruce also shows clearly the connexion between more vigorous growth and the type of branching; it is also resistant to damage by snow, a characteristic which may be regarded as a result of natural selection of a type with branching adapted to resist such damage.

Provenance trials have also confirmed the existence of many local spruce races of different cultivation value, though not as many Swedish local races as the pine. Natural selection through the centuries has evolved and stabilized a certain number of local spruce races of pronouncedly different cultivation value under different conditions.

For southern Swedish conditions, Central European spruce of suitable German provenance is preferable to the less productive native northern European form.

Both these spruces show parallel variation in branching habit. Research on the growth increment of the various types of branching by the Association in recent years has established the superior vigour of the comb type in both the northern European ("Swedish") and the Central European (German) spruces. Since the different habits in spruce are hereditary, stands with a high proportion of comb types should be specially selected for seed in the survey of élite spruce stands which has been officially approved and organized.

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* An extended summary of this paper is on file at the Bureau.

† borstgran: Norway spruce with brush-like branches—See Yale Univ., Sch. of Forestry, Bull. No. 40.

‡ bandgran: Norway spruce with closely spaced main branches and with short secondary branches—ibid.

In its work the Association maintained contacts with private owners and forestry authorities, also with the Scientific Academy of Engineers on the subject of wood technology, and with the State Railways and Telegraph Department. This last Department required a fast growing, leafy, hard and otherwise suitable timber for planting in rows as a protection against fire, and it was agreed to test at Nässjö some of the fastest growing leafy aspen and popular hybrids with other indigenous tree species suggested as suitable. Some of the Ekebo plants and cuttings of grey poplars (*Populus alba* x *P. tremula*) and *P. robusta* were also included in this test.

Pine breeding was continued but cones were scarce. One élite near Ulriksdal gave a comparatively good yield of cones. Among the new élites found during surveys were some pines of the northern Swedish type in Värmland, Vitsand and N. Finnskoga.

A plentiful harvest of spruce seed was gathered from many selected mother trees to obtain new material for progeny tests and also plants for sale. In his report on this work C. L. Kiellander points out the need for a guarantee, in the case of progeny for sale, of both the male and female parents. This was ensured by taking seed only from élite trees in élite stands.

An additional experimental area at Mölnbacka in Värmland was laid out for growth comparisons between spruces of different branching habit. Figures are cited showing that the comb spruces surpassed the other types in height and diameter.

As a new advance in spruce breeding, artificial crosses were made with trees nearly 300 metres high in an élite stand at Boserup, using scaffolding, which will now make large scale hybridization possible. The mother trees were two comb spruces, one "brush" spruce and one "band" spruce, all extremely pronounced types as regards their characteristic branching habit and of the highest vigour. The objects of the crosses were: (*a*) to cross élite trees, using first-class pollinators, and compare the differences between their progeny and the offspring from open pollination; (*b*) to cross the most extreme types as regards branching habit and thus study its inheritance (it is not unlikely that the progeny may in some cases surpass the spruce types in volume production); and (*c*) to cross German spruce in the Boserup stands with first class Swedish spruce from Värmland and Dalarna, with a view to obtaining heterosis.

In the Boserup crosses from 100 cross-pollinated flowers, 21 cones with 5455 seeds were obtained. These were sown in the greenhouse in March, 1943.

Kiellander's report on experiments with cuttings and bottle-grafting stresses the importance in forest tree breeding of vegetative propagation as a method of assembling specimens of élite trees from various parts of the country.

The difficulty of vegetative propagation of conifers was confirmed in 1941–42 when only about 10 spruce cuttings took root. These are, however, of great practical value, as they came from very good trees which can thus be inter-crossed at Ekebo.

In general, results with bottle-grafts with spruce and pine were less satisfactory in 1942; none of the spruce grafts survived and only a few narrow and broad crowned Småland pines were alive by the end of the year. The results with larch were much better even though few stocks were available. *Larix leptolepis* is the best species for the purpose and is more resistant to canker than other species. The scions were from selected trees of *L. sibirica*, *L. leptolepis* and other species.

The larch is promising material for the production of heterotic species hybrids. A mature cone has already been obtained on one of the *L. kurilensis* grafts after crossing with *L. leptolepis*.

In spite of the above mentioned disappointing results, valuable information was obtained on the technique of vegetative propagation and the care of the young plants and the value of different methods is to be treated in 1943.

The first generation interspecific larch hybrids made at Grensholm and Svalöf in 1941 appear to confirm the good reports from abroad on such hybrids. Similar crosses were made in 1942 at Grensholm and a new method of obtaining heterotic hybrids was introduced at Ekebo: the 2 best individuals were selected from each of the species *L. decidua* and *L. leptolepis* in stands 2–3 m. high at Knutstorp in Scania, and planted in large, separate tubs in the different greenhouses, 1 tree in each. Then in March it was possible to make reciprocal crosses of *L. decidua* with *L. sibirica* and *L. decidua* with *L. leptolepis*. All survived except one and yielded 55 mature cones in the first year.

Quite promising results were obtained by bottle-grafting larch.

Larch cones were gathered from various areas and the first comparative trials of this species could be started.

The crosses, made in 1941, between foreign species of conifers were recorded by Eklundh (cf.

"Plant Breeding Abstracts", Vol. XIII, Abst. 1393). The hybridization work at Kiviks-Esperöd was continued in 1942 with the main object of producing hybrids between the ordinary Swedish spruce and foreign species, e.g. *Picea sitchensis, P. Engelmanni, P. obovata* and *P. asperata.* New interspecific crosses of *Abies, Chamaecyparis* and *Tsuga* were successful. Flowering was abundant and the development of the cones proceeded normally.

Seedlings from some of C. Turesson's North American collection in 1938 were planted out in comparative trials in various localities. The severe winter of 1941–42 revealed that trees from the different provenances among the conifers brought from North America varied greatly in hardiness, especially the sitka spruce and Douglas fir; this is a factor of importance in using these foreign species in breeding for the requirements of Swedish forestry. Very hardy types, apparently genetically conditioned, were selected in the conifer plantations at Kiviks-Esperöd and at Grensholm. In the Kiviks-Esperöd arboretum in the summer of 1942, some spruces, *Abies concolor, A. nobilis* and *A. Nordmanniana, Cryptomeria japonica, Picea orientalis, P. polita* and *P. Schrenkiana, Thujopsis dolobrata* and *Tsuga Mertensiana,* showed a remarkable range of reaction, some being more or less unaffected by the winter cold and others severely damaged, while others died.

Though *Abies grandis, A. Lowiana* and *Pseudotsuga taxifolia mucronata* in general suffered badly last winter in Scania, some quite uninjured trees of these species were found at Kiviks-Esperöd and cones have been gathered from many in bearing and as large a quantity as possible from some Douglas firs.

A similar diversity was observed among conifers at Grensholm, e.g. *Abies alba, A. concolor* and *A. Nordmanniana; Pinus contorta, P. Jeffreyi* and *P. ponderosa;* and *Pseudotsuga taxifolia mucronata.* A good collection of cones was obtained from hardy specimens of the last named.

H. Johnsson reports as follows on the year's work on breeding hard wood trees:—

Aspen and Poplar

Natural stands of poplar yielded some valuable trees with the normal chromosome number which were registered for use as parents for hybridization work. Four new finds of triploid (giant) aspens were discovered; some of these clones from Gräfsnäs, Vreten and Ransäter were very fine specimens in growth form and increment. Some of them have been used in crosses during the year. With aspen and poplar, 46 crosses were made, of which 26 are pure aspen, 7 crosses of aspen and closely related poplar species, and 13 crosses involving the black and balsam poplar group. A number of crosses of *P. tremuloides* x aspen, which are specially rapid growing and of practical value, were made on a medium scale for sale.

A modification in the technique of aspen x poplar crosses has been the use of bottle-grafting.

The plants from the year's crosses were raised at Ekebo, and at the Brunsberg and Dalfors stations. In spring 1942, 12,000 plants representing 101 crosses of aspen and poplar made in 1940 and 1941, were planted out at various centres including Dagsås (Småland), where also 2500 poplars were planted out for grafting with aspen in 1943.

Large scale vegetative propagation of aspen types, presumably of practical value, has been carried out with trees having the normal chromosome number as well as with giant triploids.

Work on the induction of flowering in young aspens by grafting and by methods of cultivation has been extended.

Birch

Illustrations are given exemplifying some of the superior stands and trees selected for breeding purposes during a survey tour.

A total of 250 individual progenies, comprising 105,000 one-year-old plants from 1940 seed is now being grown at Ekebo (60,000), Brunsberg (15,000) and Dalfors (3000). These families show great variation in growth increment, general vitality and resistance to rust. Some progenies were markedly superior to the average.

Birch seed of good quality was abundant in 1942 and a collection of new seed material was made from about 350 different mother trees, "wart birches" (vårtbjörk) and "glass white birches" (glasbjörk), for experimental purposes, and also even larger amounts for direct practical use. Among the wart birches some with well formed curly grain wood were specially noted. In birch breeding, seed collection from natural stands is becoming less important as artificial crosses on grafted trees in the greenhouse have been so successful that they will take first place.

In 1942 for the first time, a relatively large number of birch hybrids, over 28,000 from *c.* 20 crosses in the greenhouses at Ekebo, could be planted out. They comprised species crosses and

crosses within both the main indigenous Swedish species, of special note being the crosses between grey birches of the best type. One-year old plants from a few crosses of *B. papyrifera* with *B. verrucosa* or *B. pubescens* showed an average height of 50 cm. with a maximum of 70 cm. for the tallest plants.

New crosses were made of the same kind and on the same scale during the year and in spring 1942 some plot experiments were laid out at Ekebo, Brunsberg and Kolleberga (Scania) with 6200 plants representing 43 progenies. The Ekebo experiment consists of comparative trials of *B. papyrifera*, *B. lutea* and the two indigenous species *B. verrucosa* and *B. pubescens*. The other experiments are to compare various individual progenies of the Swedish native birches, especially *B. pubescens*.

Methods of inducing flowering in young plants similar to those used with aspens have been applied to birch.

Beech

Seed from the 1941 harvest gave well developed plants in 1942; 100 individual progenies totalling about 75,000 plants were raised.

In spite of a relatively poor set of seed in 1942, fruits were collected from 50 mother trees and from a good stand in Halland. Also some seed was imported from comparative yield trials from a particularly good stand in Belguim.

Alder

Species and variety crosses of alder produced a fairly large quantity of seed. *Alnus glutinosa* x *A. cordata* (from Denmark) was the best species hybrid, producing fine large plants. New crosses were made in 1942 mainly between species including *A. incana*, *A. subcordata* and *A. rubra*. All the catkins of *A. cordata* trees had been destroyed by the cold so the species could not be used again in crossing. Syrach Larsen again sent *A. subcordata* and *A. rubra* material for Denmark. The 2-year old plants from 1941's sowing, having shown good growth are to be laid out in plot tests in 1943.

The same variation in photoperiodism was observed in both 2-year and 1-year-old black alders (Klibbal)* as had already been found at Ekebo among aspens. The Västerbotten alder is a pronounced long day type, as compared with the more southern and central Swedish black alders. Some speckled alders (Gråal)† from the Hedemora tract in Dalarna have proved completely adapted to the Scanian climate. Seedlings treated with colchicine in 1941 were found in that year to be mainly diploid and of the few with reduplicated chromosome numbers in the root cells, some had by 1942 only diploid cells. Catkins, which were abundant, were collected in various districts.

At Brunsberg Branch Station a survey was made of a mixed planting of *A. glutinosa* and *A. incana* and of the amount of crossing between them.

Ash

An attempt was made to graft the foreign species, *F. americana*, *F. mandshurica*, *F. Ornus* and *F. pennsylvanica*, on the same stock as in 1941, namely 3-year-old plants of *F. americana*; but most of the flower buds were damaged by frost except some on *F. pennsylvanica* and *F. Ornus*.

Seed obtained in 1941 was sown in June and seedlings from 1940 were ready for transplanting as a preliminary to comparative field trials.

Treatment to induce root formation in herbaceous cuttings gave poor results and other methods of vegetative propagation are to be tried.

Elm

Bottle-grafts of *Ulmus glabra*, *U. campestris*, *U. laevis* and *U. americana* were made and subsequent hybridizations between the various species or between varieties exceeded expectations. The set from bottle-grafting was better and more abundant than from cut branches. The hybrid seedlings grew well but no particularly fast growing type could yet be distinguished. Comparative trials are planned for 1943.

Propagation by herbaceous cuttings gave good results, especially with root hormone treatment of material from 2–3 year old plants. At Kärrbogärde in Västergötland, H. Nilsson-Ehle discovered in 1941 a possible tetraploid with remarkably large leaves and big branches; its offspring were triploids. Cytological examination, however, showed that the chromosome number of this elm

* Klibbal: Black alder, *Alnus glutinosa* Gartn., so defined in Yale Univ., Sch. of Forestry, Bull. No. 40.
† Gråal: Speckled alder. *Alnus incana* (L.) Moench., so defined in Yale Univ., Sch. of Forestry, Bull. No. 40.

was the normal 28 and the triploid forms were therefore probably due to the production of unreduced gametes in the parental generation. Any triploids obtained by crossing normal individuals with the Kärrbogärde elm with unreduced gametes may, it is believed, resemble the valuable giant aspen in its vigorous growth and they are therefore to be raised in large numbers. Bottle-grafting is also to be applied to this elm in conjunction with hybridization with different diploid races.

The chromosome laboratory carried out chromosome determinations in connexion with (1) species crosses of birch, alder and elm, and (2) colchicine treated plants, including *inter alia* large numbers of spruce, elm and birch; all of this gave valuable information for future work on grafting Chromosome determinations were also made, where necessary, from mother trees in natural stands, which lead to the discovery *inter alia* of the above mentioned triploid elm and triploid aspen clones.

The work of the chemical laboratory continued on the same lines as in 1941. Analyses of the material intended for use as parents in breeding were carried out, and as material gradually becomes available from the breeding operations, the young plants will be examined to discover any differences in the chemical composition of the wood and in the structure of the fibre.

In continued collaboration with the Scientific Academy of Engineers (cf. Abst. 1001) it has been decided, if a government grant can be obtained, to begin work at the Central Laboratory of the Cellulose Industry, to elucidate any problems in the Association's work on the qualitative improvement of races of Swedish forest trees. Different clones of aspen have been examined and a definite difference has been found in the chemical composition of the wood; the variation, which is genetically conditioned, is sufficiently large to be demonstrated by the methods of analysis used.

In further studies by the Low Temperature Laboratory on ash trees, the trees that shed their leaves latest again showed incomplete lignification of the annual shoots, a clear indication of greater susceptibility to early autumn frosts.

In spring the Low Temperature Laboratory was at the disposal of the Lund University Institute for Research on Genetics for cytological work on *Salix* species.

Of the affiliated branch stations, only those at Linköping and Brunsberg were able to carry on more or less undisturbed.

E. Runquist reports as follows on the work at the northern branch stations at Backe and Dalfors.

In 1942 pine cones were again collected for comparative experiments. Collections were also made from broad crowned pine and the "average type" of narrow crowned pine for comparison. The seed was sown mainly in the Dalfors nursery, with good results.

Other pine sowings were made with seed from élite trees at Föllinge and other places, the object being to study the effect of removal eastwards from high lying areas to the coast by comparing the progeny of the Föllinge pines with that of élite pines at the Södra Backsjö Experimental estate.

Strangulation experiments with young pine (*c.* 15 years old) were conducted with some apparent success. The fact that strangulation of spruce in 1940 had produced no signs of flower formation in autumn 1942 is attributed to periodicity in flowering which apparently affects the spruce more than the pine.

Spruce cones of 100 trees in different stands were gathered for comparative trials.

Runquist also did a spruce survey in the Gimo area during which he also made a collection of branches of curly birch (masurvedsbjörk) for grafting.

Grafting material was also collected from extreme types in a stand of the worm-like spruce (ormgran) at Hornberga and from Raivola larch at Rankhyttan for use at Ekebo.

Birch surveys were also continued. Seed was collected primarily from mother trees formerly selected. A small number of élite trees were also chosen in the Aspberg forest. The birch type there seems, judging from the exterior, to be a particularly fine type in the combination *B. verrucosa* x *B. pubescens*. Pure *B. pubescens* apparently does not occur. Seed was taken from some élite trees and "normal trees" at Aspberget.

On the new ground taken over at Dalfors 41,000 1-year-old birches from mother trees in northern and central Sweden and elsewhere were transplanted and sowings of spruce and pine were made. About 3270 aspens (*Populus tremula*) and hybrids of *P. tremula* x *P. tremuloides* from Ekebo were also transplanted.

A study of photoperiodism in pine and spruce has been begun at Backe.

Plantings of American pine material are being compared with Swedish pine at Dalfors.

Suitable mother trees (élites) of pine and spruce were selected for hybridization work in the future.

B. Lindquist and Runquist (director of the station) continued their work on races of forest trees and an analysis of the regional distribution of the pine in Norrland was undertaken (cf. "Plant Breeding Abstracts", Vol. XIV, Abst. 646). Various stations were allowed to use élite pines selected by Lindquist at Dalfors and Backe for hybridization work and as a source of branches for grafting operations.

Director Enar Andersson reports as follows on the work of the newly opened Brunsberg Branch Station in Värmland (cf. Abst. 1005).

During surveys in Värmland cones from pine mother trees were gathered in Brunsberg, Geijersholm and elsewhere.

Among the numerous crosses made, those of spruce and pine may, it is hoped, produce forms superior to the parent types. Several successful tours were made to collect superior spruce phenotypes as breeding material.

Aspen and birch have been planted out at Brunsberg for comparative trials.

Progeny tests of larch are also contemplated.

Surveys in Värmland, carried out primarily to select suitable spruces for seed, should also be of interest for breeding as some élite stands, hitherto unknown to the Association, were discovered.
F. von Schantz reports on the work of the Linköping Branch Station.
Progress was made in equipping the institute at Berga.

With the consent of the Royal Domain authorities the Association laid out large experimental areas in the pine stands in the crown forest at (1) Götaström, (2) Tjureda (offspring from these stands had already given evidence of remarkably rapid growth); and (3) at Stenseryd in the region occupied by fine branched north-east Småland pine.

A few crosses were made on six pines, three at Tjureda and three at Stenseryd and also on two at Lunnaby.

A closer study of the apparent genetic variation already observed in pine populations in neighbouring districts was begun.

About 6000 plants were set out at Växio in an experimental field trial of pine progenies of southern and central Swedish origin.

Some spruce cones from trees free from rot, though in severely damaged stands at Omberg, were sown at Berga where spruce plants from Ekebo are being raised for field experiments.
At Grensholm strangulation experiments with *Larix* species were begun and cuttings of these have been laid out at Berga, where oak acorns from the previous year were also sown. A small arboretum was started at Berga with plants from Ekebo. Birch seed was taken from previously selected mother trees and some new mother birches and aspens were selected during a tour.

This report is to be continued.

1005. Andersson, E. 634.972:575(48.5)
Brunsbergsfilialen i verksamhet—dess förädlingsuppgifter. (**The Brunsberg Branch Station starts work—its tasks in breeding**).
Svensk PappTidn. 1943 : **46** : 343–51, 400–02.

Events leading up to the opening of this new station for the forest area in Värmland are recorded, with particulars of its equipment and facilities for breeding, cytological and sylvicultural operations.

The surveys made by the Association for Forest Tree Breeding in Värmland during 1939–41 and its aims and methods are outlined and the application of genetics and cytology to tree breeding is explained. The technique of strangulation to induce flowering, which is based on Klebs' carbohydrate/nitrogen hypothesis, is described. The possibility of breeding disease resistant forms is suggested with special reference to root rot of pine and rust in the birch.

The work of the Brunsberg Station in 1942 included survey tours in Värmland, during which trees for testing were selected and material for grafting and for cuttings was collected. Much attention was devoted to the spruces of the area, which comprise much breeding material of the highest quality, including the comb spruces which, as was shown by an analysis of the spruce population in one area on the basis of Kraft's classification by stem classes, exhibited their usual superiority

over the other forms. The predominant form of spruce as regards branching habit varies in different localities and in some places transitional types were observed, which supports the view that there are many local races of different cultivation value. Such material should provide interesting results from progeny tests in comparative trials.

Seven selected mother trees of spruce from Brunsberg and Fredros were artificially pollinated, some *inter se* and some with pollen from élite phenotypes in Fredros. All crosses were successful except one and the cones were well developed and free from fungous disease.

Another spruce experiment was laid out with 300 four-year-old trees from the Gyllebo crown forest in Scania that had been grown from seed set under conditions of open-pollination by uninfected individuals in a stand severely affected by root rot. Resistance to rot and also the cultivation value of the German spruce in Värmland are to be tested. Details are also given of another experiment on rot infection of spruce trees, together with the technique used, the biology of distribution of the fungus and methods of control.

The effects of strangulation on flowering in young and old conifers were studied, and also of colchicine treatment of growing spruce seed.

Experiments were also begun to evolve methods of rapid propagation of the few exceptionally promising forest trees, produced either naturally or artificially, that may be expected to be obtained from each locality. Vegetative propagation offers great possibilities in (1) establishing seed plantations for such trees, and (2) in the raising of adequate numbers of clonal plants of the control trees used in the different comparative trials in each experimental area. Work on root formation in spruce cuttings was undertaken. In view of the importance of studying the development of cuttings in relation to seedlings for each species of tree, extensive experiments on herbaceous and lignified cuttings were begun and some results are reported here.

Spruce cones for progeny tests were collected in numerous districts from 625 mother trees in all, while for commercial purposes 295 hectolitres of spruce cones were gathered from élite phenotypes in several areas.

Pine cones were taken from seventy mother trees. Out of about 10 very fine élite pines some were used as mother trees in hybridization.

Other crosses with superior pines were made but both trees and scaffolding were destroyed by storm. Some branches with cones were however saved from one Brunsberg mother tree and sent to Ekebo for grafting.

Comparative trials of aspen and birch were planted out at Brunsberg to study the timber production per unit of area of different progenies and their capacity for natural pruning, form of crown and stem and resistance to disease, especially rot.

Also at Brunsberg there are progenies from hybrids between *Populus tremula* and *P. alba*. The hybrids have proved particularly fast growing though the stem form is inferior. Some interesting progenies were also obtained from crosses of Swedish aspens and American (*P. tremuloides*).

A comparative birch experiment included *Betula verrucosa*, *B. pubescens* and *B. papyrifera* and also *B. lutea* raised at Ekebo.

Large numbers of alder and birch plants were received from transplanting for future trials with deciduous trees and also 41,032 seedlings from Ekebo, representing the hybrid progenies of Swedish aspens and, in one case, of crosses between American and Swedish aspens from various districts.

Birch seed (*B. verrucosa* and *B. pubescens*) was collected from a number of areas for progeny tests or for commercial purposes. Curly birch (masurbjörk) and "laciniate birch" (flikbladsbjörk) seed was also gathered.

During a survey in Stor Åsen, in the Lijsvik area, a number of black alder (klibbal), speckled alder (gråal) and some grey birch (gråbjörk) were selected for breeding purposes.

In connexion with a study which is being made by the Association for Forest Tree Breeding at its Branch Stations of the cultivation value of American conifers when grown in various latitudes in Sweden, the Brunsberg Station has charge of 4450 plants of *Picea*, *Abies*, *Pseudotsuga* and *Chamaecyparis* and 1370 plants of *Pinus resinosa*, *P. Banksiana*, *P. strobus*, *P. ponderosa* and *P. contorta*. The American material was obtained from seed collected by G. Turesson during his expedition to N. America in 1938.

As a result of numerous survey tours and co-operation between the Association and forest officers of the sylvicultural protection and management service, many valuable specimens and stands of birch species, spruce and pine, were recorded as well as other information of interest to the Association.

1006. Sylvén, N. 634.972:575(48.5)
Skogsträdsförädlingen under 1941. Från Föreningens för växtförädling av skogsträd verksamhet. (**Forest tree breeding during 1941—From the work of the Association for Forest Tree Breeding**).
Skogen 1942 : **29** : 173–75.
This report has already been reviewed in "Plant Breeding Abstracts", Vol. XIII, Absts 608 and 957.

1007. 634.972.3:576.312.38
Suto, T. 633.584.3:576.312.38:582
(**Meiotic chromosomes in *Populus nigra* and *Toisusu cardiophylla***).
Jap. J. Genet. 1938 : **16** : 304–06.
Owing to its resemblances to *Populus*, *Toisusu cardiophylla* has been proposed by Professor Kimura as the type of a new genus, though this plant was formerly classed under *Salix*.
This paper is a study of the behaviour of the bivalents in *P. nigra* L. and *Toisusu* (*Salix*) *cardiophylla* Kimura ($n = 19$) with special reference to the long disputed problem of unequal chromosome pairs and secondary pairing in the latter genus.
The results confirmed the observations of Blackburn and Harrison (1924).
In addition to the triploid forms already recorded of *P. alba*, *P. canescens* and *P. tremula*, none of which were intersexes or hermaphrodites, the author found a male triploid *P. nigra* which he believes is of the "*Vallisneria*" type. The number of trivalents in meiosis averaged 13 and the plant is assumed to be an autotriploid. As a rule the bivalents far exceed the univalents, which may be explained by pairing of non-homologous chromosomes; and if this pairing is taken to indicate kinship between the bivalents concerned, it provides evidence of secondary pairing.
Other aberrations noted, e.g. lagging of chromosomes, bridge formation and multipolar division, etc., have already been recorded by Müntzing for triploid *P. tremula* (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1405).
Tetraploid pollen mother cells, though rare, have been found in the diploid *Populus*. These may in the author's view be partly responsible for the production of auto-triploids in nature.
In *P. nigra* and *Toisusu cardiophylla* secondary pairing of bivalents occurred in 55% of cases and 45% respectively. It was not at random but between particular chromosomes. Chromosome 10 (grading by size) showed unequal chromosome pairs.
From his observations the writer concludes that: (1) secondary pairing may occur between chromosomes of the same or of different sizes; (2) if secondary pairing is interpreted as indicating kinship between plants of the same origin, bivalents in the willow family could be traced back to a group of 7 chromosome pairs, the willow being then regarded as a secondary polyploid. No such group was however actually observed even where secondary pairing was most frequent.

1008. Redman, K. 634.972.3:582
Nomenclature confusion of *Populus candicans* Aiton.
J. Amer. Pharm. Ass. 1942 : **31** : 140–41.
[From For. Absts. 1943 : **5** : p. 22].
The conflicting botanical ranks allotted to this poplar by various authorities are enumerated.

1009. Jensen, H. W. 634.973:576.356
Um estudo citológico comparativo de *Thalictrum* e *Ilex*. (**A comparative cytological study of *Thalictrum* and *Ilex***).
Bragantia, São Paulo 1943 : **3** : 199–222.
The chromosome numbers of four species of *Thalictrum* and five species of *Ilex* from North Carolina, U.S.A., were determined. Those of the *Ilex* species were as follows: *Ilex decidua*, $n = 20$; *I. monticola*, $n = 20$; *I. vomitoria*, $n = 20$; *I. opaca*, $n = 18$; and *I. verticillata*, $n = 18$. Meiotic irregularities in the form of lagging chromosomes were found either in the first or second divisions in all five species. They were never present in more than about 50% of the pollen mother cells examined. It is assumed that only the pollen which is produced from normal meiotic divisions effects fertilization, since the somatic chromosome number of all five species is constant.
The author considers that the evolution of sex chromosomes in the higher plants proceeds via a heterochromosome stage such as is seen in *Ilex* at the present time; here, the heterochromosomes are associated with meiotic irregularities, which arise perhaps from previous disturbances caused by interspecific hybridization.

1010. GUENTHER, E. 634.973:581.192:576.16(94)
Australian *Eucalyptus* oils.
Drug and Cosmetic Ind. 1942 : **51** : 160–67, 203, 281–85, 404–09.
[From For. Absts. 1943 : **5** : p. 53].
Oils quite different in chemical composition may be produced by botanically identical trees. Four physiological forms have been established for *E. dives* and a similar occurrence has been recorded for *E. radiata* and *E. australiana.*

1011. STEINBAUER, G. P. 634.973:581.481
Frequency of polyembryony in *Fraxinus* seeds.
Bot. Gaz. 1943 : **105** : p. 285.
Polyembryonic seeds have been observed in *F. nigra, F. americana* and *F. velutina.*

1012. DORMAN, K. W.,
SCHOPMEYER, C. S. and
SNOW, A. G. 634.975:581.162.3:578.08
Top bracing and guying in the breeding of southern pines.
J. For. 1944 : **42** : 140–41.
In order that breeding operations such as bagging and pollination may be carried out in the slash pine (*Pinus caribaea*) and the long-leaf pine (*P. palustris*), it is necessary to brace the tops of the trees to prevent breakage and to provide efficient working conditions. J. W. B. S.

1013. ERDTMAN, H. 634.975:581.192:575
Tallkärnvedens fenoliska substanser IV. (**Phenol substances of heart wood of pine. IV**).
Svensk PappTidn. 1943 : **46** : p. 532.
In this paper on membrane forming substances, some results are incidentally mentioned from a study of the heart wood of *Pinus Strobus, P. nigra, P. montana, P. Banksiana* and *P. palustris.* All appear to contain phenols of the "pinosylvin" type, sometimes with phenolic substances belonging to other group (flavones).

1014. 634.975:581.6:575.061.1
Bör kamgranen gynnas vid beståndsvårdshuggningarna? (**Should the comb spruce be spared in sylvicultural felling?**)
Skogsägaren 1941 : **17** : No. 6 : p. 145.
Nils Sylvén's definitions of various types of spruces are cited with his opinion on the superiority of the comb spruce in its soundness and rate of growth and from the practical standpoint (cf. "Plant Breeding Abstracts", Vol. XIV, Abst. 318). Also in analyses of the cellulose output obtainable from the various spruces of different branching habit the comb spruce has held its own well. It seems therefore that the question of sparing this spruce in felling should be seriously considered.

1015. WAKELEY, P. C. 634.975.00.14(73)
Geographic source of loblolly pine seed.
J. For. 1944 : **42** : 23–32.
Seed of loblolly pine (*Pinus Taeda*) from different sources in Louisiana, Texas, Georgia and Arkansas was planted in experimental plots in eastern Louisiana. After 15 years, the 4 lots of stock did not differ significantly in average survival, which ranged from 84·6 to 89·3%. Significant differences were observed, however, in height, diameter, cubic foot volume, cordwood volume and resistance to *Cronartium fusiforme.* The stock from Louisiana was significantly better than the others in one or more characteristics. J. W. B. S.

VEGETABLES 635

1016. LAMM, R. 635:575(48.5)
Nyare undersökningar på köksväxtodlingens område. (**Recent investigations in the sphere of vegetable growing**).
Sverig. Pomol. Fören. Årsskr. 1943 : **44** : 88–98.
Owing to the war, information from countries other than Sweden has been curtailed. The report deals in detail with the results of variety trials and approved varieties but excludes work bearing on plant breeding.
Among the first-class strains of special interest are Superb O.E./42, a high yielding, disease resistant cucumber for growing in the open, with particularly large fruits; Amager vinter (Winter

Amager) W:s/42, a late high-yielding white cabbage; and Halvlång (Semi-long) O.J.O./42, a parsnip of excellent quality. For localities unsuitable to Amager the medium late variety Jaatun which keeps relatively long is recommended. Savoys, red cabbages and cauliflowers, including the Danish variety, Stor Dansk (Large Danish), suitable for various districts, are mentioned.
B. Hylmö's report (1934–42) is cited on the principles underlying Swedish variety tests of horticultural crops; it comprises also descriptions of the individual varieties tested. Of these 19 were foreign and 26 of Swedish origin. To facilitate the identification of the varieties a list of systematic characters was drawn up. Among the points of practical importance considered in the judging were yield, earliness, quality, plant height and disease resistance.
Popoff's work on paprika is cited (cf. Abst. 944). Similar work with varieties of var. *longum* and var. *grossum*, in progress at Alnarp, includes estimations of the dry matter, carbohydrate, protein, vitamin C and carotene content of the forms. Considerable variation has been recorded. Chemical studies of the sugar content of white cabbage in cold weather have also been made and early and late varieties were found to differ in this respect.
A. H. Bremer's results (1941) in Norway on the vitamin C content of vegetables are compared with those of E. Johansson (1939–40) at Alnarp.

1017. 635:575(49.4)
634:575(49.4)
Meier, K.
Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für das Jahr 1940. (**Report of the Federal Experiment Station for viticulture and horticulture at Wädenswil for the year 1940**).
Landw. Jb. Schweiz 1943 : **57** : 419–61.

In this annual report, the following may be of interest to plant breeders.

Fruit Culture

Descriptions have been published in the Schweiz. Zeit. f. Obst und Weinbau of the greengage Reneklode aus Oullins, the plum Laxtons Early, and the Italian or Fellenborg prune. A large number of local and foreign varieties are being tested. Unsuitable plants and those susceptible to disease are discarded and their places taken by the progeny of new crosses.

Viticulture

Work was limited to observations on existing crosses.

Horticulture

Three new raspberry varieties have been put on the market; Andenken an Paul Camenzind equals, in regard to the shape and size of the berries the varieties Preusser and Lloyd George from which it is derived. In Wädenswil and in Dielsdorf it has, however, proved to be considerably more robust and higher yielding. Rote Wädenswiler is suggested as a substitute for Winklers Sämling which does not thrive everywhere. Gelbe Wädenswiler, a sister variety to Andenken an Paul Camenzind, is a yellow form with sweet and aromatic fruit.
Breeding with French and runner beans continues. In cabbage breeding the Einschneidekabis Type II seems in head size to have the advantage of Type III. The Bergkabis, which planted in the middle of July, still produces ripe heads, is not good for storage and has been crossed with Amager to combine the excellent storage properties of that variety with the short vegetative period of Bergkabis. R. M. I.

1018. 635:581.6(43)
Reinhold, J.
Die Haltbarkeit von Gemüse ein wichtiger Qualitätsfaktor. (**The keeping properties of vegetables, an important quality factor**).
Z. PflKrankh. 1943 : **53** : 175–99.

Some of the causes on which the keeping qualities of vegetables depend, viz. manuring, nitrogen, dry matter content and varietal differences, were investigated. Varietal differences have a much slighter effect than manuring. In carrots, the variety Marktgärtner was not a good keeper, Nantaise was intermediate, and Rotherz, Roter Riesen and Sudenburger were good. In celery, Wiener Riesen was satisfactory but the results fluctuated. R. M. I.

1019. 635.00.14(76.4)
Hawthorn, L. R.
Tests of vegetable varieties for the winter garden region, 1937–1941.
Bull. Tex. Agric. Exp. Sta. 1943 : No. 626 : Pp. 50.

The results of tests of new or previously untried varieties of the following vegetables are given: bean, beet, carrot, sweet corn, edible cowpea, cucumber, egg plant, lettuce, musk-melon, okra,

onion, English pea, hot pepper, sweet pepper, paprika pepper, tomato, and water-melon. A useful summary of the most promising varieties of each vegetable is also included.

1020. KLAWITTER, G. and SENGBUSCH, R. v. 635.13:575(43)
Zielsetzung und Probleme in der Speisemöhrenzüchtung. (**The objectives and problems of carrot breeding**).
Züchter 1943 : **15** : 16–22.

The following characters are listed as selection criteria for carrot breeding: cylindrical and entire roots tapering at the apex, fine lateral rootlets, absence of the tendency for root emergence from the soil, a low proportion of central core, thin cambium, a firm connexion between the core and cortex, absence of hollowness when ripe, a uniform texture and dark red colour in the core, cambium and cortex, good storage capacity, no bolting, no cracking, high carotene content, high sugar content, good taste and palatable consistency.
Selection methods are discussed and it is suggested that selection itself should be done in the food preservation factories. There is much intravarietal variation and it should be possible to select plants ideal for particular characters and then to cross these to produce synthetic varieties. Problems of seed production are also discussed.

1021. KLAWITTER, G. and SENGBUSCH, R. v. 635.13:575.42:578.08
Methodisches zur Möhrenzüchtung: Querschneidemethode als Voraussetzung für die Verarbeitung einer grossen Zahl von Einzelrüben zwecks Auslese auf Qualitätseigenschaften. (**Methods of carrot breeding; a method of transverse sectioning as a necessary basis for the handling of a large number of individual roots for the purpose of quality selection**).
Züchter 1943 : **15** : p. 91.

By cutting carrots across transversely and waxing the exposed surface of the upper part, it is possible to test the lower portion for quality factors and to utilize the upper for seed production.

1022. KLAWITTER, G. and SENGBUSCH, R. v. 635.13:581.6·575.42
Züchterische Untersuchungen des Aufbaues, der Färbung, des Refraktometerwertes und des Geschmacks von Speisemöhren. (**Breeding researches on the morphology, coloration, refractometer value and taste of carrots**).
Züchter 1943 : **15** : 44–46.

After pointing out that carrot varieties exhibit considerable intravarietal differences, the authors list the following selection criteria: thick cortex, narrow cambium, small and "non-glossy" xylem and uniform dark red coloration. Varieties differ not only in their colour at harvesting but also in their capability to resist colour changes during storage and after boiling. Edible quality should be tested by three observers in order to eliminate personal bias. In addition to this method of ascertaining positive and negative taste substances, the refractometer is used for determining the sugar content.
Good taste and high sugar content are associated with dark red coloration but the converse relationship does not hold.

1023. SCHUPHAN, W. 635.13:581.6:577.16
Biochemische Sortenprüfung an Gartenmöhren als neuzeitliche Grundlage für planvolle Züchtungsarbeit. (**Biochemical variety tests on garden carrots as a modern basis for planned breeding work**).
Züchter 1943 : **15** : p. 90.

The author corrects some figures in a previous paper (cf. "Plant Breeding Abstracts", Vol. XII, Abst. 872) and reports that the high carotene value of Neuzüchtung X has not been maintained in later tests.

1024. EHRENBURG, P. M. 635.25:575(47)
(**A brief account of work in improving the Dungan onion**).
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamsa (Bull. V.R. Williams Kazah. Inst. Agric.) 1940 : No. 7–8 : 11–19.

The Dungan onion is a local variety cultivated in southern Kazahstan. It obtained its name

from the Dungans who, it is believed, when they settled in Russian territory during the second half of the nineteenth century, brought the onion with them from the neighbouring Chinese provinces. Its ultimate origin, however, is believed to have been somewhere in south-western Asia; perhaps between Palestine and India.

The present population of this onion is genetically heterogeneous; three main shapes of bulb are to be met with; bulbs of one shape are notable for high yields, those of another for the large proportion reaching maturity, and those of the third for having the largest weight per bulb. Furthermore, red, pink, yellow, and white bulbs occur, the main colour being red. Red bulbs with a violet shade have been found to keep better and to be more resistant than the others to rotting at the neck. In one type, the stalk of the inflorescence is short, and the seeds ripen simultaneously.

As a result of individual selection, five lines have been isolated, though no conclusive results have yet been obtained.

Mass selection has also been practised, and its effect was noticeable within a short time.

The keeping qualities of the onion have been the object of special attention, and hybridization has been employed to bring about improvement in this respect. The usual methods of storage are not always successful, though the bulbs keep well in a frozen state.

Improvement of this onion is still proceeding. A number of useful characteristics are now possessed by it. Its keeping qualities are described as "satisfactory"; and when the bulbs are in a frozen state such qualities are described as "good". It is immune to attack by downy mildew, yields a large proportion of mature bulbs, does not bolt, and is not killed by late spring frosts. Its yields are better than those of "Kaba" and its keeping qualities than those of "Jalta". When grown in rows 45 to 50 cm. apart, yields of 15 to 25 tons per ha. have been obtained. I. Z.

1025. Ellenhorn, Ja. E. 635.25:576.312.34
(Difference in the chromomeres of allelomorphic satellited chromosomes in *Allium Cepa*).
Doklady Acad. Nauk S.S.S.R. 1940 : **27** : 357–60.

A race of onion is described in which one of the two homologues of the satellited chromosome pair bears satellites of smaller dimensions than the other, which is normal. Some of the condensation loci of the former homologue appear to have been lost by deletion.

1026. Schmidt, M. 635.34
Die Kopfkohlsorten der Sortenliste. **(The varieties of headed cabbage of the variety list).**
Obst- u. Gemüseb. 1941 : **87** : 132-34; 1942 : **88** : p. 4.
[From Gartenbauwiss. 1942 : **17** : (49)–(50)].

From the official variety list of white, savoy and red cabbage for 1941, the author has compiled short descriptions of the standard types with indications of the objects for future breeding work. R. M. I.

1027. Brieger. F. G. and 635.34:575(81)
Gurgel, J. T. A. 635–1.531.12(81)
Seleção e produção de sementes em hortaliças (com referência especial ao gênero *Brassica*). [**Selection and seed production in vegetables (with special reference to the genus *Brassica*)**].
Bragantia, São Paulo 1942 : **2** : 449–80.

Some general considerations are first presented, such as the need for selecting the plants for seed production during the growing season, for avoiding the constant selection of the earliest seeders, and for preventing cross-pollination. The instance of Piracicaba in Brazil is cited, where it has been impossible to obtain good seed of either cauliflower or broccoli since the two have been grown in close propinquity. The same situation has been observed in the cabbages and kales. A list is given of the *Brassica* forms cultivated in Brazil, which include forms of *B. oleracea* and *B. juncea*. The former species presents the greatest difficulties in seed production. The first of these is failure to flower, especially in the first year, without special treatment; one form of cabbage was induced to flower after 10 months from germination by removing the leaves one by one as they appeared. Further experiments on these lines are in progress. The second difficulty is the production of defective flowers; the third is self-sterility; a fair amount of self-fertility exists however in *Brassica* and it is thought preferable to make use of that as far as possible

before having recourse to pseudo-fertility or, failing that, to crossing. From the quantitative mode of inheritance of most characters of economic importance, it is also argued that crossing should be avoided, except at least between individuals of the same type.
Good prospects are envisaged for seed production in Brazil of *Brassica* and many other vegetables which are discussed very briefly.

1028. Barr, C. G. and
Newcomer, E. H. 635.34:576.356.5:577.16:581.192
Physiological aspects of tetraploidy in cabbage.
J. Agric. Res. 1943 : **67** : 329–36.

The ascorbic acid, sugars, starch, acid-hydrolysable substances and soluble and colloidal nitrogen content of tetraploid cabbages were determined and compared with those of diploid tissue.
Tetraploid cabbage contained 36·48% more sugar, 23·86% more ascorbic acid and 32·62% more colloidal nitrogen than diploid cabbage, but the diploid had 14% more soluble nitrogen and a higher ash content.
The lower leaves of immature tetraploid cabbage plants had a very high ascorbic acid content but much less at maturity while comparable diploid leaves though lower in the first place decreased less with maturity.

1029. 635.52:581.143.26:581.035
Koleff, N. 635.52:581.143.26:581.036
Untersuchungen über die Keimruhe bei Salatsamen (*L. sativa* var. *capitata* L.). [**Investigations on lettuce seed dormancy (*L. sativa* var. *capitata* L.)**].
Gartenbauwiss. 1943 : **17** : 263–72.

All the varieties of lettuce examined germinated well when kept in the dark at a temperature of 20°–22° C. Marked varietal differences appeared, however, when the seeds were exposed to light, some varieties being unaffected while the germination capacity of others exhibited various degrees of inhibition. Anomalous germination was also observed in a number of the light-treated varieties, the cotyledons developing before the radicle; this feature appeared to be a varietal character.
Increase in temperature over 25° C. differentiated between the varieties in a similar way. Some varieties were unaffected while others showed a reduction in percentage germination. High temperatures did not appear to induce anomalous germination.
The author discusses the significance of these results and also the effect of seed storage on germination capacity. The relevance of photoperiodic data in this connexion is mentioned and the selection of types able to germinate under conditions of light exposure and high temperature is recommended.

1030. Martin, J. P. and
Pemperton, C. E. 635.52–2.7–1.521.6
Disease symptoms in lettuce and celtuce, caused by the bean leaf hopper *Empoasca Solana* Del.
Hawaii. Plant. Rec. 1942 : **46** : 111–18.

A disease in lettuce and celtuce caused by the bean leaf hopper, *Empoasca solana*, is described. Symptoms have also been recorded on endive. There was a difference in varietal susceptibility; New York 12 and Imperial 44 and 847 were severely infected while the green Mignonette variety was only moderately affected.

1031. 635.611–2.421.1–1.521.6:575.12
Cantaloup lovers.
Seed World 1943 : **54** : No. 8 : p. 16.

A new cantaloupe will shortly be placed on the United States market; it is known as Powdery Mildew Resistant Cantaloup No. 5. The disease resistance was obtained from an inedible Indian type. When grown in the Imperial Valley, California, it yields more than 200 crates to the acre, 25–50 crates more than the average. Certain imperfections are to be found in this type, however, including a tendency to "sugar crack", lack of uniformity in size and shape, and a later maturity than most popular varieties.

1032. Mann, L. K. 635.615:581.145.2:581.162.3
Fruit shape of watermelon as affected by placement of pollen on stigma.
Bot. Gaz. 1943 : **105** : 257–62.

"Analyzed by the *t*-test for unique samples, the mean difference in cross-sectional area between pollinated and unpollinated carpels of mature melons is significant beyond the 1 per cent. level".

1033. Bailey, L. H. 635.62:582:581.9(73)
Species *Cucurbitae*.
Gentes Herbarum, Ithaca, N.Y. 1943 : **6** : 267–322.

A monograph is presented of the species of *Cucurbita* known to grow wild in the U.S.A., Mexico, Guatemala and British Honduras. Several new species are described and these and the other types are figured and described.

1034. Hartmair, V. 635.63:581.04:576.356.5
Colchicininduzierte Polyploidie bei Gurken. (**Colchicine-induced polyploidy in cucumbers**).
Züchter 1943 : **15** : 13–16.

Tetraploid cucumbers have been produced by the colchicine technique and these are figured and described, the differences between them and the diploid ancestors being noted.

1035. Mühlendyck, E. 635.64:581.47:581.143.32
Beiträge zur Morphologie der Frucht der Tomate (*Solanum Lycopersicum*). [**Contributions to the morphology of the tomato fruit (S. *Lycopersicum*)**].
Z. Pflanzenz. 1943 : **25** : 117–63.

The author proposes a classification of tomato varieties on the basis of fruit morphology. Most of the paper reports the results of investigations into the causes and types of fasciation encountered within the groups recognized.

1036. Daskaloff, C. 635.64:581.6:575.127.2
Neue Ergebnisse aus Kreuzungen *Sol. racemigerum* x Sarya und Plowdiwer. (**New results from crossing S. *racemigerum* with Sarya and Plowdiwer**).
Züchter 1943 : **15** : 92–97.

The tomato varieties Sarya and Plowdiwer have been crossed to various strains of *S. racemigerum* and the hybrids back-crossed both to Sarya and Plowdiwer. It was found that the back-cross progenies produced better yields, larger fruits and a higher dry matter content than the parent varieties. They also gave more tomato juice and this, on analysis, showed a higher sugar and acid content, and a better taste than the extract from the parents.

1037. Hagiwara, T. and
Iida, H. 635.646:575.127.2
(**On the species hybrid between *Solanum integrifolium* Poir. and *Solanum melongena* L.**).
Bot. and Zool. 1938 : **6** : 858–64.

This cross between *S. integrifolium* Poir. and *S. Melongena* L. var. Shironasu succeeded only when *S. Melongena* was the male parent; it produced 100 seeds, 93 of which germinated. The F_1 showed heterosis and resembled *S. integrifolium* in leaf shape and flower colour. Unlike Tatebe's results (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1391), no sterility was found though the seed production of the F_1 was low; and a further point of difference was the occurrence of segregation of the F_1, which had green stems, into green, light purple and purple in the F_2. To explain this the writer postulates three genes, *R* producing purple stems, *r* green, H_1 strongly inhibiting *R* and H_2 weakly inhibiting *R*.
The authors' observations on the presence of spines on stem and leaf, marginal notches of the leaf, oblate shape of fruit, etc., in *S. integrifolium* agree with Tatebe's report. These characters as well as light purple flower are classed as dominant.

1038. Youngman, W. H. 635.65(73)
America—home of the bean.
Agric. Amer. 1943 : **3** : 228–32.

A short description is given of the principal agricultural types of bean with particular reference to species in the following genera: *Phaseolus, Canavalia, Cajanus, Vigna, Dolichos* and *Vicia.* The principal producing countries in the Americas are indicated together with their most popular types. These types are illustrated in a two page plate.

1039. Ranninger, R. 635.652:581.165.72:577.17
Die vegetative Vermehrung der Buschbohne. (**Vegetative propagation of the dwarf bean**).
Gartenbauwiss. 1943 : **17** : 250–54.

Under suitable conditions of temperature and humidity, it is possible to propagate dwarf beans by the use of stem, leaf and leaflet cuttings. The hormone Belvetan was found to increase rooting.

1040. 635.652–1.8
Hardenburg, E. V. 635.652.00.14(74.7)
Experiments with field beans.
Bull. Cornell Univ. Agric. Exp. Sta. 1942 : No. 776 : Pp. 28.

A fertilizer experiment with the bean varieties Robust Pea and Red Kidney showed a significant response to nitrogen application in both types, the response being most marked in the variety Robust pea. Spacing yield trials were carried out with the types Robust Pea, Perry Marrow, Red Kidney and French White Kidney.

Comparative yield trials at Ithaca, New York, showed that Robust Pea generally out-yielded all other varieties, though Michelite, a new variety of the pea-bean type, yielded almost as well. A new variety, French White Kidney, gave higher yields than the more common types.

1041. Straib, W. 635.652–2.452:576.16:631.521.6:575.42(43)
Untersuchungen zur Biologie und Bekämpfung des Bohnenrostes *Uromyces phaseoli* (Pers.) Wint. [**Investigations on the biology and control of the bean rust *Uromyces phaseoli* (Pers.) Wint.**].
Gartenbauwiss. 1943 : **17** : 397–445.

This account of the German races of *U. Phaseoli* opens with a brief discussion of the taxonomy and nomenclature of the species and varieties previously described, together with an account of the morphological and physiological criteria used in their delimitation. It is then pointed out that a knowledge of the geographical seasonal distribution of the spore types is important in any account of their biology and this is followed by a short summary of the effects of environmental factors such as temperature and humidity, on spore germination.

Five rust races, D-1 to D-5, have been differentiated. The effects of these on the differential hosts are described and it is stated that several races may occur in one locality at the same time. A rough outline of the geographical distribution of each race is given.

Other species of *Phaseolus* besides the common bean are susceptible to one or more of these races and infection was also obtained using species of *Vigna* and *Dolichos*. The susceptibility of *Vigna sinensis* establishes a marked difference between German and American races of the fungus since the latter do not attack this species. This observation makes a re-investigation of the status of the *Uromyces* species attacking *Vigna* in southern Europe advisable.

Tables have been drawn up showing the varietal resistance of beans to races D-2 and D-5 under greenhouse and field conditions. The two environments do not always produce the same effects and the results of field tests carried out in different localities may also differ. These divergences are discussed and the danger of treating greenhouse data as anything more than a valuable indication is stressed.

Small pustule diameter and not the number of pustules per unit area is the true criterion of host resistance and should be used for purposes of selection. Bean varieties frequently differ *inter se* in respect of susceptibility, provenance sometimes being a significant factor. The lack of genetical homogeneity in varieties and occasional confusion in nomenclature have led to conflicting accounts of varietal resistance in the literature.

The need for breeding resistant types is emphasized; this may be accomplished either by direct selection for resistance or indirectly for "false" resistance, i.e. earliness; the latter alternative is only applicable in central and northern Germany where climatic conditions are unfavourable to the early spread of the pathogen.

1042. Wingard, S. A. 635.652–2.452–1.521.6:575.11:575.125
New rust-resistant pole beans of superior quality.
Bull. Va Agric. Exp. Sta. 1943 : No. 350 : Pp. 31.

The following bean crosses have been obtained: Marblehead x Powell Prolific, Kentucky Wonder x Horticultural Pole, Kentucky Wonder x Brockton Pole, Kentucky Wonder x Marblehead, Tennessee Green Pod x Improved Goddard,Tennessee Green Pod x Yellow Eye, and Boston Navy (or Navy Pea) x Improved Goddard. The seeds, except in one cross, resembled the selfed seeds of the female parent but the adult plants were heterotic and intermediate in pod characters between the parents.

An outline is given of the mode of inheritance of seed colour, also of the genetics of rust susceptibility. In general, resistance behaves as a monohybrid dominant.

Descriptions are given of the ten Virginia Wonder varieties (cf. "Plant Breeding Abstracts", Vol. XIII, Abst. 1420).

1043. Izarlišvili, S. Ja. 635.652–2.483–1.521.6(47)
[**Establishing the degree of resistance of different dwarf bean varieties to anthracnose (*Colletotrichum Lindemuthianum* Br. et. Cav.) under the conditions of the Georgian S.S.R.**].
Izv. Gruzinsk. Opytn. Stanc. Zašč. Rast. (Bull. Georgian Pl. Protection Res. Sta.) 1940 : **2** : 227–52.

The various factors influencing the severity of infection are discussed and the symptoms of the disease described.

Artificial infections were made on 26 *Phaseolus* varieties at different stages of development in the greenhouse. Ten of the varieties were also subjected to artificial infection in the field. Some varieties displayed a high degree of resistance both in the growing plant and in the pods; these were *P. obl. crustulinus purpureopunctatus* and Nos 527, 633, 654 and 525* of the collection. Certain other varieties were susceptible in the growing plant but slightly resistant in the pod.

Observations were made on the fructification of the fungus on different culture media and on its mode of overwintering.

1044. Zaumeyer, W. J. and
Harter, L. L. 635.652–2.8–1.521.6
Two new virus diseases of beans.
J. Agric. Res. 1943 : **67** : 305–28.

Two new closely related viruses of the bean (*Phaseolus vulgaris* L.) are described and compared with other viruses to which the bean is susceptible. The two viruses have been named bean mosaic virus 4 and 4A. Infection produced local lesions on some varieties and systemic infection on others, while of 80 varieties tested none were shown to be immune. Varieties subject to local-lesion infection are considered to be commercially resistant and are being used in breeding work. The reaction of other legumes is described, together with methods of inoculation, isolation and inactivation.

1045. Zaumeyer, W. J. and
Harter, L. L. 635.652–2.8–1.521.6:575.11
Inheritance of symptom expression of bean mosaic virus 4.
J. Agric. Res. 1943 : **67** : 295–300.

Studies on the inheritance of response in beans (*Phaseolus vulgaris* L.) to the bean mosaic virus indicate that the expression of symptoms is governed by a single pair of genes. Presence of the dominant gene produces a practically non-injurious local-lesion type of infection, whilst when the recessive gene only is present the virus becomes systemic and produces leaf mottling, stunting and a reduction in yield. When possessing the dominant gene the beans, although not immune, can be considered to be commercially resistant. Varieties possessing this gene are being used for breeding other similarly resistant types.

1046. Earley, E. B. 635.655–2.19–1.521.6
Minor element studies with soybeans: I. Varietal reaction to concentrations of zinc in excess of the nutritional requirement.
J. Amer. Soc. Agron. 1943 : **35** : 1012–23.

A high concentration of zinc in the nutrient solution was deleterious to the health of soya beans

* Given as 526 in the summary.

grown in pots in the greenhouse, but there were marked varietal differences in tolerance. Hudson Manchu tolerated a concentration eight to twelve times that which killed the variety Peking. Generally in the varieties studied, early maturity and large seeds seemed to be correlated with resistance, and lateness and small seeds with susceptibility.

1047. Enzie, W. D. 635.656:575(73)
New pea varieties compared for yield and plant characters.
Fm Res. N.Y. 1943 : **9** : No. 1 : (Repr. No. 34) : Pp. 3.

Six new varieties of canning or freezing peas are described. Greenland is a vigorous growing type resembling Alaska; Early Harvest (not a recent introduction) is resistant to *Fusarium* wilt and resembles Surprise; Ace is an early, slender and vigorous canning pea; Ranger is a late variety resembling Perfection and should be suitable as an ungraded canning variety; Atlas is a late vigorous canning pea with indifferent quality; Shasta is a mid-season freezing variety resembling Thomas Laxton; and Miracle is an introduction from England and might possibly replace Alderman.

1048. Rubin, B. A. and
Lutikova, O. T. 635.656:577.15
(Enzyme action in peas in relation to the development and productivity of the plants).
Doklady Akad. Nauk S.S.S.R. 1940 : **27** : 34–37.

Comparisons were made between the enzyme activity of late and early varieties of pea, both of the sugar and common types and at different stages of development.

1049. Dodonowa, E. W. 635.656:577.15:575.12
Über den Unterschied der Erbsensame nach dem Gehalt an Dehydrases. (**On the differences in peas judged by dehydrogenase content**).
Enzymologia, Hague 1941 : **9** : 373–79.
[From Biol. Abst. 1944 : **18** : Sect. A : Abst. 67].

Species of peas differ in reducing capacity, wrinkled peas having a greater reducing action than smooth ones, and hybrids between wrinkled and smooth an intermediate activity. The dehydrogenase activity of peas is a genotypical characteristic and is transmitted with the morphological and chemical characteristics. The reducing ability of individual seeds of the same kind of pea vary only insignificantly.

1050. Kopetz, L. M. 635.656:581.036:581.143.26.035.1
Über den Einfluss der Temperatur auf Wachstum und Entwicklung einiger Pflückerbsensorten. (**On the influence of temperature on the growth and development of some kitchen pea varieties**).
Gartenbauwiss. 1943 : **17** : 255–62.

The period between sprouting and flowering was measured for a number of pea varieties, each of which was sown on a number of successive occasions. It was found that, for all varieties, the period of development was longest in the early sowings, after which it fell steadily to a minimum, thereafter increasing once more.

In an attempt to discover a varietal developmental character independent of environmental fluctuations, the author applies the concept of "pure heat total" (reine Wärmsumme) which is defined as the sum of the average daily temperatures between germination and blooming. This character displays constancy within a variety and is not affected significantly by the date and year of planting or by the locality.

Photoperiodic effects however exert a considerable influence on this value and experiments were undertaken to ascertain their importance. It was concluded that the "pure heat total" remains constant only when the plants are in a state of "pure vegetative development" (reine vegetative Entwicklung), i.e. in the optimum condition in respect of the effects due to the sequence of day lengths. The action of photoperiodic effects was analysed in terms of the concept of critical levels.

It is believed that the conclusions derived may be applied also to beans.

1051. KELLY, I. and
ANDERSON, E. 635.67:576.312.32(72)
Sweet corn in Jalisco.
Ann. Mo. Bot. Gdn. 1943 : **30** : 405–12.
A brief account is presented of the morphology, cytology and distribution of the sweet corn grown in Jalisco, Mexico.

1052. CALDWELL, J. S. and
CULPEPPER, C. W. 635.67:581.6
Suitability for dehydration of 34 varieties and strains of sweet corn. Part III.
Canner 1943 : **96** : No. 21 : 15–16, 28.
This paper deals with the importance of colour in the choice of varieties and goes on to discuss the effect of dehydration technique on the final products.

1053. 635.8:581.162.5:575.74
KLIGMAN, A. M. 635.8:575.242
Some cultural and genetic problems in the cultivation of the mushroom, *Agaricus campestris* Fr.
Amer. J. Bot. 1943 : **30** : 745–63.
The trinomial *A. campestris* Fr. var. *bisporus* is proposed for the cultivated mushroom.
From 7 to 25 nuclei are found in the hyphal cells and these divide independently and show no tendency towards pairing. Conjugate nuclear division is believed not to occur. Single spore cultures may give rise to normal sporophores and this is held to demonstrate the homothallism of this species. Monosporous isolates differ markedly in morphological and physiological properties, 20–30% being sterile. Multisporous cultures are always fertile.
Sporophores could be obtained in some cases by pairing sterile races. No evidence was obtained however of differentiation into unisexual strains. It is improbable moreover that the two nuclei that fuse in the basidium are sexually opposed. If this is so, the nuclear fusion would represent a residual trait derived from heterothallic ancestors and devoid of any present genetical significance.
Several mutants and saltants are described and the stability of the latter discussed with reference to the influence of environmental factors.
The author combats the widely held view that mushroom strains necessarily degenerate under cultural conditions.
Sporophores were obtained by pairing sterile strains of brown and white types but it was not possible to conclude that the resultant fructifications were hybrids.

BOOK REVIEWS

MAGNUSSEN, J.,
MADSEN, O. and
VINTERBERG, H. 030.8=39.8

The English-Danish and Danish-English Dictionaries.

George Allen and Unwin, Ltd., London; Gyldendalske Boghandel, Copenhagen 1943 : 20s. Pp. 362.

The compilers of this work and their collaborators have produced an excellent and comprehensive dictionary for general use. It covers the literary and everyday language and this new edition (the 5th of the English-Danish section and the 4th of the Danish-English section) has been enlarged by 65 pages. Though obviously of value to both English and Scandinavian speakers, the dictionary is apparently primarily intended for Danes, for whom the English pronunciation is given in phonetic script. Both Danish and English readers will also find the inclusion in this edition of the past tense and past participle and the irregular verbs and some irregular plurals a very useful addition.

Idioms and up-to-date colloquialisms and slang are well represented and the meanings of numerous abbreviations such as P. and O., H.B., f.p.a., L.T.A., W.P., pd., p.c., L.G. and H.E. are also given. Many proper names and place names (including London street names) and their pronunciation will also be found.

In making their selection of every-day words the authors have accepted the fact that foreigners wishing to understand the tongue so dexterously used by De Quincy and Jane Austen must now become familiar with the modern idiom that they may know how to use (or avoid): putting the kibosh on, na poo, getting the wind up, jawbation, movies, ology (for "science") and Xtian (for Christian).

For the student both of literary English, and the colloquial language, the dictionary can be most highly recommended. Much discrimination and industry must have gone to its compilation, and also an excellent knowledge of contemporary English and its standards as they are evolving under the stimulus of a somewhat self-conscious "democracy", not perhaps entirely native in origin.

The book is well got up, allowing for war economy in the quality of the paper: even that slight defect has been largely overcome by the type of printing adopted in which all key words stand out clearly in clarendon type. The price for the two volumes in one is very moderate and should be within the reach of all libraries and schools and students, translators and other linguists.

Two errors noticed are recorded here, merely so that they may be corrected in the next edition: "mother queen" in the English section should be "queen mother" and "kibosh", which is only used in the phrase already cited, means "to put a stop to" and *not* "nonsense" as the Danish equivalent given implies. The existence of the English "bosh" (= nonsense) may have caused confusion here.

CROWELL, I. H. and
LAVALÉE, E. 632(71)

Check list of diseases of economic plants in Canada.

Dom. Dep. Agric., Sci. Serv., Canada 1942 : Pp. 68. (Mimeographed).

This useful list of plant diseases may be recommended to all those concerned with plant pathology in Canada. The plants are arranged alphabetically under their Latin names, the diseases being listed under each species. English and French equivalents are given for each disease, many of the French names being literal translations from the English. Vernacular names for the host plants are indexed in English and French.

The definitions suggested for root rot, stem rot and basal rot introduce a welcome precision into the common names of diseases, and the exclusion of the terms crown rot, collar rot and foot rot, from general use is a progressive measure.

A few orthographical errors occur but these will doubtless be removed when the list is issued in a more permanent form.

633.491:581.6(48.5)
633.491:582(48.5)

Osvald, H.
Potatis. (**The potato**).
Kooperativa Förbundets Bokförlag, Stockholm Kr.2:50 : Pp. 128. photos. illus.

This compact and well-produced and illustrated booklet deals with the improvement of the quality of potatoes in Sweden, concentrating particularly on choice of variety, harvesting and storage, including measures against diseases. The following aspects of the subject are discussed: the importance of the potato; its origin and characteristics; variation; varieties and synonyms; blight resistant varieties; cultivation, selection of seed potatoes; harvesting, grading, storage, packing and transport; vitamin C content; and diseases and pests.

Hawkes, J. G. 633.491-1.524(8)
Potato Collecting Expeditions in Mexico and South America. II. Systematic classification of the collections.
Imperial Bureau of Plant Breeding and Genetics 1944 : 7s. 6d. Pp. 141 : tables. 3 maps. 93 figs. 2 plates.

This second bulletin on the Imperial Agricultural Bureaux Potato Collecting Expeditions deals primarily with the classification and naming of the specimens obtained. The bulletin is divided into six sections and carries three appendices.

The first two sections embody an introduction and a short historical survey of potato taxonomy. In the third section is found a general account of the botanical classification of potato species from the time of Dunal down to the present day. Embodied in this section is a dichotomous key to the various series within subsection *Hyperbasarthrum*, the portion of the genus *Solanum* to which all potatoes belong. The phylogenetic relationships of the series are then discussed, and a map showing the recorded localities of all the wild species with an indication of those collected by the expeditions is given.

Section 4 deals with the taxonomy of the specimens collected by the expeditions. The descriptions of specimens not brought back in the living state and hence of no use to plant breeders are included here, though in smaller type, in order to present a complete and scientific account of the work done, and for the benefit of future expeditions. Some 30 new wild species and five new cultivated species are described, together with one new series. Where previously known species are dealt with a certain amount of taxonomic and phylogenetic information is included where it has been thought necessary to clarify the situation or bring together certain obscure and previously isolated facts.

Section 5 gives an account of the cytological investigations on the collection. The somatic chromosome number of over 900 samples was determined, the results being embodied in the previous section on systematics. The relationship between systematic and geographical grouping and chromosome number in the different species is discussed, and the probable lines of evolution in the polyploid series of both wild and cultivated species are indicated.

The sixth section deals with the several theories on the origin and evolution of cultivated potatoes. An examination of the historical evidence for the antiquity of agriculture based on the potato leads the author to conclude that this plant was first cultivated in the region of S. Peru-N. Bolivia. This is followed by a discussion on the lack of indigenous potato cultivation in Mexico. An enquiry into the different types of weed and semi-cultivated potatoes is shown to throw some light on the types of potatoes that were first cultivated and their subsequent development. The probable relationships of the different cultivated species are discussed and the importance of the role played by man in their distribution is emphasized. The two tetraploid species *S. andigenum* and *S. tuberosum* s. str. are considered to have had a common origin in the Peru-Bolivian region and not as formed each from distinct wild species as the Russian investigators have suggested.

The final portion of this section deals with the various theories for the origin of the European potato. Evidence is presented from historical, geographical, morphological and photoperiodic points of view to show that the first introductions of potatoes came from the Andes, most probably Colombia, and not, as has so often been supposed, from Chile.

The first two appendices give the Latin descriptions and complete list with chromosome numbers respectively of the new species and varieties. The third appendix gives a complete list of identifications of the Empire Potato Collection.

The bulletin contains numerous tables, 3 maps, 93 text figures, half-tone plates and a bibliography.

633.913

Cultivation and breeding of Russian rubber-bearing plants.
Imperial Bureau of Plant Breeding and Genetics, Cambridge 1944 : 2s. 6d.
Pp. 57. (Mimeographed).

The rubber shortage that has arisen during the present war has caused a considerable amount of interest to be directed towards a number of rubber-bearing plants that have been suggested as possible substitutes for *Hevea*. The most active searches have been made by investigators in Russia and the U.S.A. The results of the former have been published mainly in the Russian language and have not been accessible to readers in other countries. They have been summarized in English by the Imperial Bureaux of Plant Breeding and Genetics and of Horticulture and Plantation Crops and are now made available in the form of a bulletin, comprising 57 foolscap pages of typewritten stencil. The bulletin outlines the results of the Russian expeditions that led to the discovery of the now famous species of *Taraxacum* and *Scorzonera* kok-saghyz, tau-saghyz and Krym-saghyz and certain other possible rubber substitute plants, gives a description of these plants, with details of their cultivation, manuring and harvesting, and of the chief pests that attack them.

The second part comprises a review of the literature dealing with the breeding of substitute rubber plants. The genera included are *Apocynum, Asclepias, Chrysothamnus, Parthenium, Scorzonera, Solidago* and *Taraxacum*. In this section reference is not confined to work published in Russia and the entire published literature is summarized.

A bibliography is appended to each half, the bibliography to the second half containing over 60 references.

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